The
Electrical Review

VOL. CXIII. NOVEMBER 10, 1933. No. 2920.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY. Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, WATLOO, LONDON." Code, A B C. Telephone No.: Hop **3333 (50 lines)**.

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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Urban Electrification

A GOOD deal has been heard of late years about the need for electrification in our rural areas, but during the past few days the searchlight of the lay Press has been turned on towns in which many streets are still without distributors. The information given in the papers is said to be authoritative, and appears to be based upon a better knowledge of conditions than similar articles usually have been.

Whatever may be the effect on the general public of drawing attention thus broadly to the shortcomings of present methods, it is very important that those working in our industry itself should see the subject in the right perspective. This is especially so just now, as an attempt may be made to obstruct the plans for an extended E.D.A. on the ground that it is of no use boosting electricity unless supplies are first available everywhere.

We know the engineers and managers of some of the undertakings designated as "laggards" to be keen and progressive men, who give a service to their consumers that is better than that obtainable in many of the "all-cable" areas. They may not always be able to carry their committees and councils as far as they themselves want to go, it is true. Be that as it may, experience of the supply industry shows that a mere statement of the number of miles of cable means very little, unless some indication is also given of the size of cable in relation to the potential demands, and by "potential demands" we mean estimates based on the assumption that the prospective consumers will use electricity for the heavier domestic apparatus.

In many areas the existence of cables of some sort everywhere masks the true position; the cross-sectional area of the conductors is quite inadequate to meet modern needs, and the fear of undue voltage drop stands in the way of active canvassing.

It has been suggested that the cable deficiency in some towns may be due to the desire of municipalities to bolster up their gas undertakings. We have often drawn attention to the sinister influence of this common ownership, but we think that it would be a mistake to allow this factor to obscure others that are of equal importance. We know of local authorities which own gas undertakings in areas that are liberally cabled, but which encourage applications for lighting only.

To hold up E.D.A. development work until the mains are laid would prevent their being fully utilised for some time after the supplies became available. Attractive propaganda must be taken in hand at the outset, so that the public may be clamorous for electricity for all purposes, as it now is, in general, for lighting. To over-emphasise the mileage of streets still uncabled is to hide from ourselves the extent of the work that is more immediately necessary.

As much new cabling, switchgear and transformers should be required in most of the all-cable towns as in those towns where they are more obviously called for. The work will have to be done sometime; now is the time to do it, when materials are cheap and labour is waiting to be employed.

Technical Training

YEAR after year the Old Faraday House Students' dinner retains its character of a family gathering. We believe that Mr. P. V. Hunter was correct in attributing this, and a great part of the success of the college generally, to the personal interest shown by Dr. Alexander Russell in the after careers of his old pupils—an interest that is not limited to their technical attainments. The large number of men trained at Faraday House who hold responsible positions on the staffs of some of our most progressive concerns is evidence of its share in framing the great international reputation of our electrical industry. The "sandwich system" of training has stood the test of time, and the ready co-operation of manufacturers and supply undertakings is an indication of, as well as a principal factor in, its success. Sir John Brooke's suggestion that students should now be trained to use the electric power which their predecessors have provided was quite sound as giving a general indication of the field in which students will find most scope in the future; but the teaching of fundamental electrical science, possibly with a growing bias towards physics,

will always be the main work of our technical colleges. Principles provide a firm basis, whereas practical applications soon change in an industry that develops as rapidly as ours does.

The Electrical Convention

IN our issue of October 27th, p. 608, with due authority we announced that the Annual Convention of the Incorporated Municipal Electrical Association was to be held in the week commencing June 4th next year. We have now received a correction, presumably a later decision, informing us that the correct time is the week commencing May 28th, and the place of meeting Liverpool. We are left wondering whether it is all a mistake. What has become of the proposal to organise a National Electrical Convention for 1934? We should have expected that one of the first things to which the changed E.D.A. and the I.M.E.A. would devote attention would be the organisation of this long-talked-of propaganda event. The words "National Canvass" and "National Convention" are not likely to be forgotten by the electrical Press, whatever changes we make or whatever new work is taken in hand.

Flameproof Apparatus

IN our review on September 1st of the last annual report of Mr. J. A. B. Horsley, Electrical Inspector of Mines, we drew attention to the inclusion of particulars of electrical apparatus, the flameproof enclosure of which had been approved in 1932 as a result of tests made at Buxton. As earlier information on this point would be of considerable use to electrical engineers ordering plant, and to manufacturers, we give in this issue brief technical particulars of plant certified during the first nine months of this year. This information would probably not have been available for nearly twelve months in the ordinary course.

Elastic Contracting

THE Guildford Rural District Council recently invited tenders for the installation of seventy-six lighting points, stipulating the use of solid drawn conduit, iron boxes and sunk switches; the tenders were to include provision for maintaining lighting for other contractors on the job during hours of darkness and the supply company's charges. Twenty-six electrical contractors responded; the lowest undertook to do the work for about £90, while the tender at the other end of the scale was £280. In between were all sorts of figures. We do not envy the task of the adjudicator upon these offers. There is evidently something wrong somewhere when such a wide difference in quotations is possible.

Co-operation in Cooker Service

At a recent meeting of the Newcastle branch of the Electrical Contractors' Association the secretary reported that the North Eastern Electric Supply Co. was undertaking to maintain the cookers which it sold to its consumers for a period of eight years and that the company had agreed to extend this maintenance scheme to cookers sold by the members of the E.C.A. branch. This is an example of enlightened self-interest which we would like to see copied elsewhere. If a supply company wants to sell electricity it should see that the appliances on its system are kept in commsision, wherever those appliances came from in the first place, subject, of course, to the obvious necessary safeguards.

The Peterborough Explosion

THE trouble at Peterborough power station on November 2nd has been much exaggerated in the daily Press. Mr. H. A. Nevill, the engineer and manager, informs us that the effects of the explosion, which occurred in the cyclone separator on the discharge end of a ball mill, were confined to the separator itself and to the windows and corrugated-iron roof of the building in which it was situated, the protective covering of the roof (which was the only inflammable material in use) being burned. No members of the staff were injured, and the plant was continued in operation until all supplies had been transferred to the grid. The interruption in the supply which followed was on a part of the Corporation's system and lasted only five minutes. Within a short time the station was able to deal with the bulk of the local load, the balance being taken from the Central Electricity Board's system, and the whole of the plant was put into commission again during the week-end. This incident provides indication of one way in which the grid is likely to be of service to consumers.

Trolley-buses at Olympia

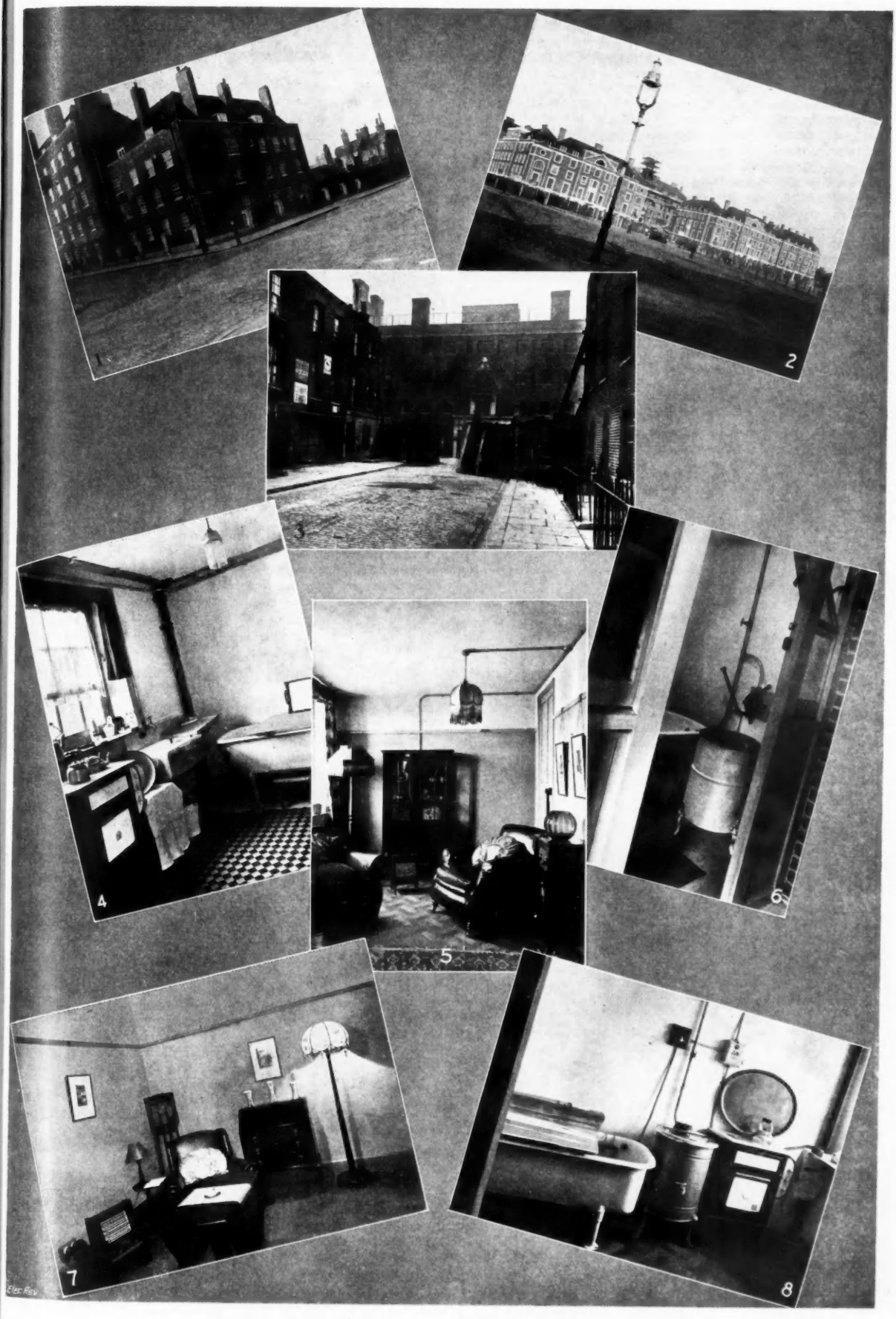
THE Commercial Motor Exhibition at Olympia demonstrates the increasing number of ways in which electricity may be applied to transport vehicles and garage equipment, but the most notable feature is the twelve trolley-buses that are shown by nine firms. Some of our leading motor manufacturers have been quick to realise that the six-fold increase in route mileage of trolley-buses within the past ten years will probably be more than maintained in the future. The trolley-bus has the advantages of operating from home-produced fuel, and of costing less in maintenance than the petrol bus, but these are not the factors that will decide its survival. Silent running and freedom from smell, combined with rapid acceleration and flexibility, are the features that make it popular. More progress has been made in recent years with the trolley-bus in Great Britain than in any other country, and the present show indicates that we are likely to maintain our pre-eminence in this field.

Re-housing Schemes

SLUM-CLEARANCE and re-housing provide a unique opportunity to introduce electricity into the homes of the less well-to-do. We have paid especial attention to securing ascertained costs of the energy required, as doubts on this point are often obstacles to complete electrification. The figures given us by Mr. Lee, borough electrical engineer and manager, St. Pancras, for his schemes, described on page 654, are quite comparable with those obtained for the Lambeth and Westminster flats of the South London Electric Supply Corporation and the Westminster Electric Supply Corporation reported in our issue of August 11, the moderate amount of which so greatly surprised a correspondent in the following issue. Consumptions over a period are alone of value, as the intermittent character of the demand and the flexibility of electrical methods to meet varying conditions are often lost sight of. The point is an old one, as those will remember who, in the early days of industrial electrification, had to show that the cost of driving a machine shop could not be readily calculated from the h.p. of the motor.

Sub-station Switchgear

THE paper on sub-station switchgear for voltages of from 3,300 to 33,000, which Mr. J. R. Mortlock read before the London Technical Group of the E.P.E.A. on Tuesday, was a soundly practical survey of the present position. The operation of switchgear under fault conditions is primarily to protect the system and only secondarily the apparatus controlled, and he rightly emphasised that initial cost should be considered in conjunction with safety and continuity of supply. We hold that saving in expenditure should be in the direction of reducing the number of breakers as far as possible and never by depreciating the quality of performance. We were glad to see the prominence given to rapid closure as well as quick breaking, as the former does not always receive the consideration it should. Rupturing duty was considered chiefly in relation to maintenance, but this is probably the chief factor in the selection of switchgear also, and, as the last Home Office report of Mr. J. G. Swann indicated, the short-circuit capacity of breakers in sub-stations under the control of industrial consumers is often quite inadequate to meet the increasing power liberated on short-circuit.



Electrically Equipped London Flats. **(See page 654)**

1. Walker House, St. Pancras, with some of the property which is being replaced on the right. 2. Cumberland Market estate. 3. St. Francis flats adjacent to old houses which are being pulled down. 4. Kitchen equipment in a three-room maisonette, Datchet House. 5. The living room of a six-room flat, Swinley House. 6. Water-heating and pumping arrangements in Ascot House. 7. A living room in Holly Lodge Mansions. 8. The kitchen of a six-room flat, Swinley House

Electrically Equipped Flats

Consumers' costs in slum-clearance residences

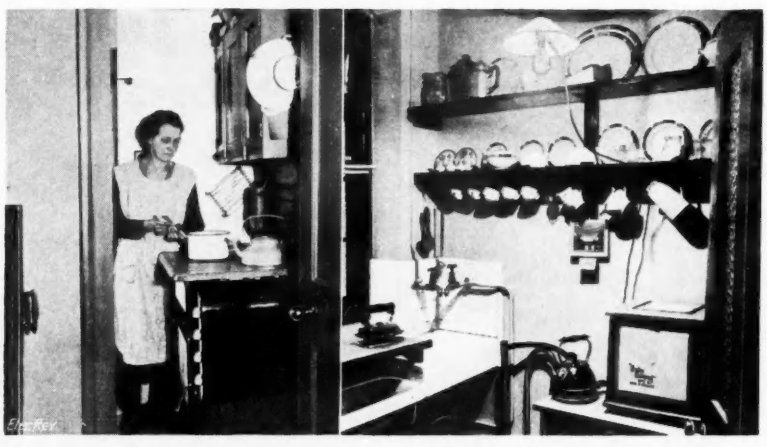
BY the courtesy and co-operation of Mr. R. Lee, borough electrical engineer and manager, St. Pancras Electricity Department, we were able recently to see some of the many electrically equipped flats of all sizes and descriptions in his area and to obtain information and photographs. By far the most interesting of these residences are those which have been built in connection with three slum clearance schemes. More than 600 of these flats are already occupied, and the consumption and costs figures given in this article relate to some of the buildings or blocks of flats for the last financial year of the undertaking.

At the London County Council Ossulston Estate, Somers Town, Walker House contains thirty-nine flats and each is equipped with a 5½-kW cooker complete with either an electric kettle or a special flat machined-bottom kettle, a 2-kW fire and a 5-lb. iron, and each flat is also afforded the use of a 10-gallon wash-boiler for one day of each week. Walker House and Chamberlain House (a similar block) were originally provided with direct central non-electric water heating. This has since been abandoned on account of expense and replaced by an indirect hot-water system supplemented by wash boilers. At the same time an electric kettle was supplied to each consumer, but because maintenance was found to be high in certain cases, owing to careless use, the undertaking now prefers to provide the special non-electric kettle, but for all that it is optional. The flats in this house include two-, three-, and four-roomed premises, the kitchen-scullery being extra in each case. The respective average annual consumptions for the three classes of flat are 1,718, 2,022 and 3,283 kWh per flat. The average weekly costs are as follows:—

	Two rooms. s. d.	Three rooms. s. d.	Four rooms. s. d.
Lighting—			
Standing charge	5	5	5
Meter rent	2	2	2
Electricity	1	1	1½
Other services—			
Electricity	1 3½	1 6½	2 6
Hire of apparatus	9	9	9
Total...	2 8½	2 11½	3 11½

In two other houses on the same estate, Phœnix Street and Levita House, there are four and 121 flats, respectively, and a 10-gall. wash-boiler is installed in each flat; this provides the whole of the hot water for the residents, including washing, baths, &c. The other equipment is precisely the same as that installed in Walker House. For Levita House the average annual consumptions per flat for the two-, three-, and four-roomed flats, respectively, are 1,709, 2,622, and 3,471 kWh. The average costs per week are as follows:—

	Two rooms. s. d.	Three rooms. s. d.	Four rooms. s. d.
Lighting—			
Standing charge	5	5	5
Meter rent	2	2	2
Electricity	1	1	1½
Other services—			
Electricity	1 3½	2 0	2 7¾
Hire of apparatus	1 1	1 1	1 1
Total...	3 0½	3 9	4 5½



Left: The kitchen of a three-room flat in Chamberlain House and (right) one in Holly Lodge Mansions

Upon the Crown Estate at Cumberland Market there are Datchet House with seventy-six flats (two, three and four rooms), Ascot House with ninety flats (one and two rooms inclusive, and two and three rooms excluding the kitchen-scullery) and Swinley House with eighty flats. Each flat in Datchet House is equipped with a 5¼-kW cooker, complete with a kettle, a 2-kW fire and a 5-lb. iron. The respective average annual consumptions per flat for the two-, three- and four-room residences are 1,623, 2,172 and 2,779 kWh. The average weekly costs are as follows:—

A cooker, calorifier and wash-boiler in a compact kitchen in St. Francis' flats

	Two room. s. d.	Three rooms. s. d.	Four rooms. s. d.
Lighting—			
Standing charge	5	5	5
Meter rent	2	2	2
Electricity	1	1	1½
Other services—			
Electricity	1 2½	1 8	2 1½
Hire of apparatus	8	8	8
Total...	2 6½	3 0	3 5¾

In Ascot House the average annual consumption for the one-room and two-room flats (without kitchen-sculleries) are 884 and 1,627 kWh, and the figures for the two-room and three-room flats, with extra kitchen-sculleries, are 1,889 and 2,513 kWh. The weekly costs are tabulated at the foot of this column.

The equipment in each flat in Ascot House, excluding the one-roomed flats, is the same as that in the Datchet House flats, with the addition of a 10-gal. wash boiler. The one-roomed flat has a cooker and an iron only. Datchet House was the first of the scheme to be completed, and each flat is equipped with a gas copper. The next block to be completed, Ascot House, has in each residence the wash-boiler with pumping arrangements for serving the sink and the bath; while in the latest development, Swinley House, the wash-boiler in each flat has a siphoning arrangement serving both the sink and the bath. For the one-roomed flats there is a bathroom with a wash-boiler serving both the bath and the sink, common to a set of three flats.

Some of the largest flats that we saw are in Swinley House, where there are residences with up to six rooms. We were disappointed to see only one of four bedrooms equipped with an outlet. We were told that initial expense difficulties resulted in this unsatisfactory arrangement, but we feel strongly that owing to the character of the buildings and the service, everything should have been done to have taken full advantage of the portability of the electric fire, particularly in a flat without provision for any other form of heating in

	One room. s. d.	Two rooms. s. d.	Kitchen-scullery and Two rooms. s. d.	Kitchen-scullery and Three rooms. s. d.
Lighting—				
Standing charge	5	6	6	6
Meter rent	2	2	2	2
Electricity	¾	¾	1	1
Other services—				
Electricity	7¾	1 2¾	1 5	1 11
Hire of apparatus	6	1 0	1 0	1 0
Total	1 9½	2 11½	3 2	3 8

the bedrooms. One lady seemed to have overcome this difficulty very happily by arranging a portable fire on the landing and leaving all the bedroom doors open.

Mr. J. H. Bryan, who is consumers' advisor to the electricity undertaking, and helped us in our quest and who is an enthusiast, is very keen on the use of the wash-boiler for all hot-water supplies in this class of house, and certainly many of the consumers find it a very satisfactory arrangement. Some of the people heat their wash-boiler water every morning for the day's use for washing-up, &c., and they find that this provides a comfortable heat for the kitchen.

At Bridgewater and Sidney Streets, Somers Town, the St. Pancras House Improvement Society, Ltd., has completed three blocks of flats—St. George's (forty), St. Christopher's (thirty), and St. Francis' (thirty-eight). Each flat has a 5½-kW cooker, a 2-kW fire, a 5-lb. iron, a kettle and a 10-gall. calorifier. The average annual consumption for the two-, three-, and four-roomed flats in the St. George's group are 1,852, 2,288 and 3,159 kWh, respectively, and the average weekly costs are shown in the table at the end of this article.

While in all cases there is a coal fire in each flat, there is no doubt that the consumers make good use of the electric fires provided, not only in the bedrooms, but extensively in the sitting rooms. Both the standing charges and the hire charges are collected, with the rent, by the estate authorities by special arrangement with the supply undertaking.

At Holly Lodge Mansions, Highgate, we saw some of the 600 electrically equipped flats run by Lady Workers' Homes, Ltd. A typical flat has a sitting room with an alcove bedroom, and also a kitchen; the kitchen is equipped with a baby-type cooker (which we were told was developed specially for this estate), a kettle and an iron. Plugs are provided in both the living and bedrooms (alcove), and there is a 2-kW fire. There is no alternative in any of the flats on this estate to the electrical service.

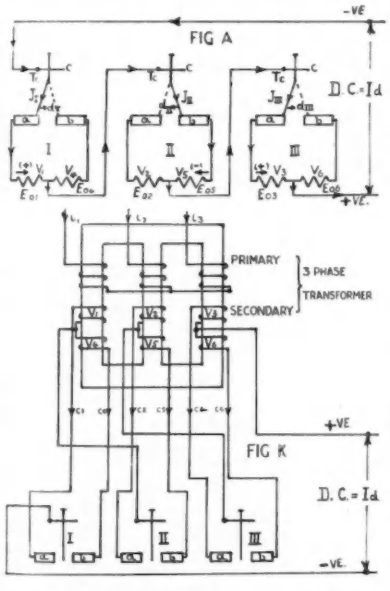
The consumer makes her own arrangements as to hiring or purchasing the electrical equipment, while the standing charge is included in the rent by an arrangement similar to that for the other flats described. In all cases, therefore, the consumer simply pays directly to the undertaking one halfpenny per kWh consumed. In these Holly Lodge flats hot water is provided from a central system. Obviously electricity is used very extensively, and everybody is well satisfied. An all-electric kitchen serving the restaurant on the estate is an attractive feature.

	Two rooms. s. d.	Kitchen-scullery and Three rooms. s. d.	Four rooms. s. d.
Lighting—			
Standing charge	5	5	5
Meter rent	2	2	2
Electricity	1	1	1½
Other services—			
Electricity	1 5	1 9	2 5
Hire of apparatus	1 3	1 3	1 3
Total...	3 4	3 8	4 4½

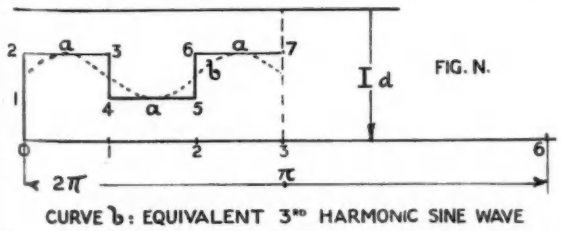
Mercury Jet-wave Rectifiers. By W. E. French, M.I.E.E., A.M.Inst.C.E.

The voltage and current relations in six-phase series-connected sets

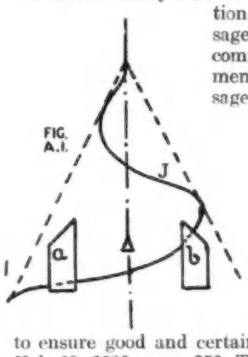
THE voltage relations in six-phase series-connected mercury jet-wave rectifiers may be explained by reference to figs. A to H. Fig. A shows the three commutators, the main electrodes being connected to the respective transformer secondaries. The appearance of the mercury jet wave is indicated in fig. A$_1$. The jet waves (J_1, J_{11}, J_{111}) connect alternately, and rhythmically with the frequency of the supply, the collecting or curry-comb electrodes (*c*) with the main electrodes (*a*, *b*). The terminal Tc of the collecting electrode of commutator I forms the negative pole and the middle tap of the transformer secondaries of commutator III provides the positive pole of the d.c. side.

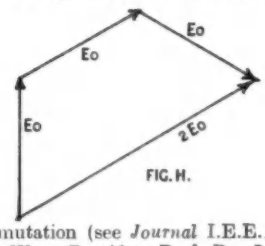


To follow the sequence in which the series commutators connect, commutate and co-ordinate the voltages of the transformer, the following convention is adopted: The positive flow is from left to right ($l \longrightarrow r$); this will correspond with the positive half-wave of the alternating e.m.f. The voltages E_{01} and E_{04} are the potentials across each transformer half



(or phase) V_1 and V_4 of commutator I; E_{02} and E_{05} are the potentials across the phases V_2 and V_5 of commutator II; E_{03} and E_{06} are the potentials across the phases V_3 and V_6 of commutator III. E_0 is, in all cases, the maximum value of the alternating e.m.f. waves across any of the transformer phases on the secondary side. It is further assumed that commutation takes place exactly at the zero passage of the voltage wave; in practice, the commutation is slightly advanced, commencing a little ahead of the zero passage of the voltage wave. This is done





to ensure good and certain commutation (see *Journal* I.E.E., Vol. 68, 1930, page 956, The Jet Wave Rectifier, Prof. Dr. J. Hartmann).

Figs. B, C, D show the alternating e.m.f. waves across the secondary phases, E_{02} lagging by 120 deg. and E_{03} by 240 deg. behind E_{01}. The period 2π has been divided into six equal time intervals. Selecting the time interval "1," at this instant commutator III (fig. D) should be commutating, since its voltage wave is passing through zero. Before the moment "1" the voltage of commutator III was positive and its direction left to right ($l \longrightarrow r$). Thus, up to instant "1" jet J_{111} must have connected "*c*" to "*a*" of commutator III, as indicated in fig. A by the full line. At and after the moment "1" jet J_{111} must have changed over to the electrode (*b*), shown dotted, keeping contact with the latter until moment "4" is reached, after which it must revert again to the position (*ca*) until the time interval "1" (not shown) is attained. Hence, at "1" the wave E_{03} (right) or E_{06} (across V_6) is commutated and transferred to the positive side as shown dotted (curve E_{03}, fig. F). The current flow is indicated by arrows. Further, the arrows (d_1, d_{11}, d_{111}) give the direction in which commutation must take place, or in other words, the direction in which the jet wave must move at the instant considered; the arrows ($r \longrightarrow l$, and $l \longrightarrow r$, fig. F) serve the same purpose.

Again, at the instant "2" commutator II will be commutating, as its voltage curve is passing through zero. Previous to this time the voltage curve E_{02} (right) or E_{05} is negative and its directional flow is $r \longrightarrow l$, and the jet J_{11} must have joined the collecting electrode (*c*) to the main electrode (*b*), fig. A. As with commutator I, at and after the instant "2" the jet J_{11} will have so changed its position that "*c*" is connected to "*a*" (chain-dotted in fig. A) until the time interval "5" is reached, when the play is repeated with commutator II. Therefore, the commutator II commutates $r \longrightarrow l$ (fig. F) at the instant "2," and as indicated by the arrow d_{11}, fig. A The e.m.f. wave E_{02} is positive; before "2" it was negative and shown as E_{02} (right) or E_{05} (fig. C) and had to be com-

Electrically Equipped Flats

Consumers' costs in slum-clearance residences

BY the courtesy and co-operation of Mr. R. Lee, borough electrical engineer and manager, St. Pancras Electricity Department, we were able recently to see some of the many electrically equipped flats of all sizes and descriptions in his area and to obtain information and photographs. By far the most interesting of these residences are those which have been built in connection with three slum clearance schemes. More than 600 of these flats are already occupied, and the consumption and costs figures given in this article relate to some of the buildings or blocks of flats for the last financial year of the undertaking.

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Meter rent	2	2	2
Electricity	1	1	1½
Other services—			
Electricity	1 3½	1 6¼	2 6
Hire of apparatus	9	9	9
Total...	2 8½	2 11¼	3 11½

In two other houses on the same estate, Phœnix Street and Levita House, there are four and 121 flats, respectively, and a 10-gall. wash-boiler is installed in each flat; this provides the whole of the hot water for the residents, including washing, baths, &c. The other equipment is precisely the same as that installed in Walker House. For Levita House the average annual consumptions per flat for the two-, three-, and four-roomed flats, respectively, are 1,709, 2,622, and 3,471 kWh. The average costs per week are as follows:—

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Standing charge	5	5	5
Meter rent	2	2	2
Electricity	1	1	1½
Other services—			
Electricity	1 3½	2 0	2 7¾
Hire of apparatus	1 1	1 1	1 1
Total...	3 0½	3 9	4 5¼

Left: The kitchen of a three-room flat in Chamberlain House and (right) one in Holly Lodge Mansions

Upon the Crown Estate at Cumberland Market there are Datchet House with seventy-six flats (two, three and four rooms), Ascot House with ninety flats (one and two rooms inclusive, and two and three rooms excluding the kitchen-scullery) and Swinley House with eighty flats. Each flat in Datchet House is equipped with a 5½-kW cooker, complete with a kettle, a 2-kW fire and a 5-lb. iron. The respective average annual consumptions per flat for the two-, three- and four-room residences are 1,623, 2,172 and 2,779 kWh. The average weekly costs are as follows:—

A cooker, calorifier and wash-boiler in a compact kitchen in St. Francis' flats

	Two room. s. d.	Three rooms. s. d.	Four rooms. s. d.
Lighting—			
Standing charge	5	5	5
Meter rent	2	2	2
Electricity	1	1	1½
Other services—			
Electricity	1 2½	1 8	2 1¼
Hire of apparatus	8	8	8
Total...	2 6½	3 0	3 5¾

In Ascot House the average annual consumption for the one-room and two-room flats (without kitchen-sculleries) are 884 and 1,627 kWh, and the figures for the two-room and three-room flats, with extra kitchen-sculleries, are 1,889 and 2,513 kWh. The weekly costs are tabulated at the foot of this column.

The equipment in each flat in Ascot House, excluding the one-roomed flats, is the same as that in the Datchet House flats, with the addition of a 10-gal. wash boiler. The one-roomed flat has a cooker and an iron only. Datchet House was the first of the scheme to be completed, and each flat is equipped with a gas copper. The next block to be completed, Ascot House, has in each residence the wash-boiler with pumping arrangements for serving the sink and the bath; while in the latest development, Swinley House, the wash-boiler in each flat has a siphoning arrangement serving both the sink and the bath. For the one-roomed flats there is a bathroom with a wash-boiler serving both the bath and the sink, common to a set of three flats.

Some of the largest flats that we saw are in Swinley House, where there are residences with up to six rooms. We were disappointed to see only one of four bedrooms equipped with an outlet. We were told that initial expense difficulties resulted in this unsatisfactory arrangement, but we feel strongly that owing to the character of the buildings and the service, everything should have been done to have taken full advantage of the portability of the electric fire, particularly in a flat without provision for any other form of heating in

	One room. s. d.	Two rooms. s. d.	Kitchen-scullery and Two rooms. s. d.	Kitchen-scullery and Three rooms. s. d.
Lighting—				
Standing charge	5	6	6	6
Meter rent	2	2	2	2
Electricity	¾	¾	1	1
Other services—				
Electricity	7¾	1 2¾	1 5	1 11
Hire of apparatus	6	1 0	1 0	1 0
Total	1 9½	2 11¼	3 2	3 8

the bedrooms. One lady seemed to have overcome this difficulty very happily by arranging a portable fire on the landing and leaving all the bedroom doors open.

Mr. J. H. Bryan, who is consumers' advisor to the electricity undertaking, and helped us in our quest and who is an enthusiast, is very keen on the use of the wash-boiler for all hot-water supplies in this class of house, and certainly many of the consumers find it a very satisfactory arrangement. Some of the people heat their wash-boiler water every morning for the day's use for washing-up, &c., and they find that this provides a comfortable heat for the kitchen.

At Bridgewater and Sidney Streets, Somers Town, the St. Pancras House Improvement Society, Ltd., has completed three blocks of flats—St. George's (forty), St. Christopher's (thirty), and St. Francis' (thirty-eight). Each flat has a 5½-kW cooker, a 2-kW fire, a 5-lb. iron, a kettle and a 10-gall. calorifier. The average annual consumption for the two-, three-, and four-roomed flats in the St. George's group are 1,852, 2,288 and 3,159 kWh, respectively, and the average weekly costs are shown in the table at the end of this article.

While in all cases there is a coal fire in each flat, there is no doubt that the consumers make good use of the electric fires provided, not only in the bedrooms, but extensively in the sitting rooms. Both the standing charges and the hire charges are collected, with the rent, by the estate authorities by special arrangement with the supply undertaking.

At Holly Lodge Mansions, Highgate, we saw some of the 600 electrically equipped flats run by Lady Workers' Homes, Ltd. A typical flat has a sitting room with an alcove bedroom, and also a kitchen; the kitchen is equipped with a baby-type cooker (which we were told was developed specially for this estate), a kettle and an iron. Plugs are provided in both the living and bedrooms (alcove), and there is a 2-kW fire. There is no alternative in any of the flats on this estate to the electrical service.

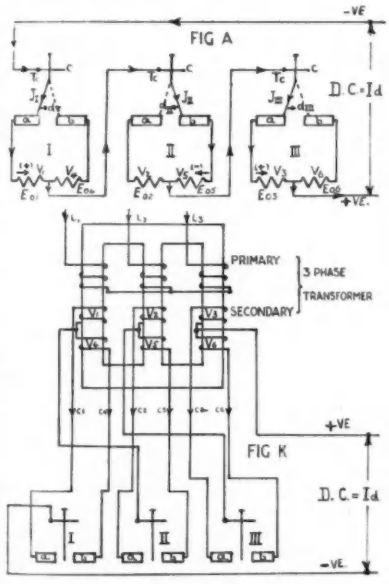
The consumer makes her own arrangements as to hiring or purchasing the electrical equipment, while the standing charge is included in the rent by an arrangement similar to that for the other flats described. In all cases, therefore, the consumer simply pays directly to the undertaking one halfpenny per kWh consumed. In these Holly Lodge flats hot water is provided from a central system. Obviously electricity is used very extensively, and everybody is well satisfied. An all-electric kitchen serving the restaurant on the estate is an attractive feature.

	Two rooms. s. d.	Kitchen-scullery and Three rooms. s. d.	Four rooms. s. d.
Lighting—			
Standing charge	5	5	5
Meter rent	2	2	2
Electricity	1	1	1½
Other services—			
Electricity	1 5	1 9	2 5
Hire of apparatus	1 3	1 3	1 3
Total...	3 4	3 8	4 4½

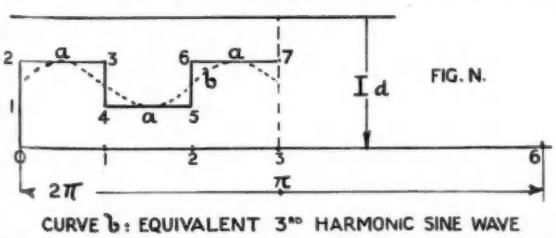
Mercury Jet-wave Rectifiers. By W. E. French, M.I.E.E., A.M.Inst.C.E.

The voltage and current relations in six-phase series-connected sets

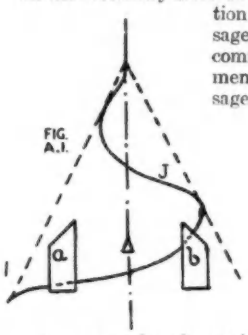
THE voltage relations in six-phase series-connected mercury jet-wave rectifiers may be explained by reference to figs. A to H. Fig. A shows the three commutators, the main electrodes being connected to the respective transformer secondaries. The appearance of the mercury jet wave is indicated in fig. A_1. The jet waves (J_I, J_{II}, J_{III}) connect alternately, and rhythmically with the frequency of the supply, the collecting or curry-comb electrodes (*c*) with the main electrodes (*a*, *b*). The terminal Tc of the collecting electrode of commutator I forms the negative pole and the middle tap of the transformer secondaries of commutator III provides the positive pole of the d.c. side.

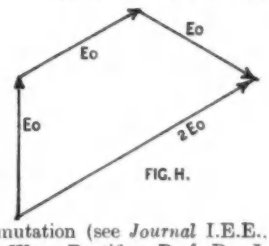


To follow the sequence in which the series commutators connect, commutate and co-ordinate the voltages of the transformer, the following convention is adopted: The positive flow is from left to right ($l \longrightarrow r$); this will correspond with the positive half-wave of the alternating e.m.f. The voltages E_{o1} and E_{o4} are the potentials across each transformer half



(or phase) V_1 and V_4 of commutator I; E_{o2} and E_{o5} are the potentials across the phases V_2 and V_5 of commutator II; E_{o3} and E_{o6} are the potentials across the phases V_3 and V_6 of commutator III. E_o is, in all cases, the maximum value of the alternating e.m.f. waves across any of the transformer phases on the secondary side. It is further assumed that commutation takes place exactly at the zero passage of the voltage wave; in practice, the commutation is slightly advanced, commencing a little ahead of the zero passage of the voltage wave. This is done





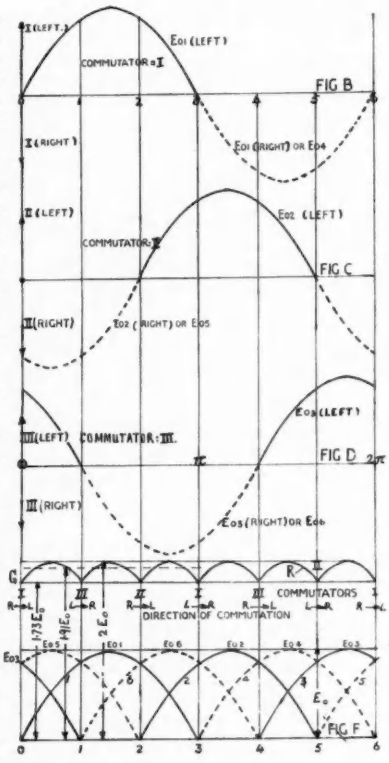
to ensure good and certain commutation (see *Journal* I.E.E., Vol. 68, 1930, page 956, The Jet Wave Rectifier, Prof. Dr. J. Hartmann).

Figs. B, C, D show the alternating e.m.f. waves across the secondary phases, E_{o2} lagging by 120 deg. and E_{o3} by 240 deg. behind E_{o1}. The period 2π has been divided into six equal time intervals. Selecting the time interval "1," at this instant commutator III (fig. D) should be commutating, since its voltage wave is passing through zero. Before the moment "1" the voltage of commutator III was positive and its direction left to right ($l \longrightarrow r$). Thus, up to instant "1" jet J_{III} must have connected "*c*" to "*a*" of commutator III, as indicated in fig. A by the full line. At and after the moment "1" jet J_{III} must have changed over to the electrode (*b*), shown dotted, keeping contact with the latter until moment "4" is reached, after which it must revert again to the position (*ca*) until the time interval "1" (not shown) is attained. Hence, at "1" the wave E_{o3} (right) or E_{o6} (across V_6) is commutated and transferred to the positive side as shown dotted (curve E_{o3}, fig. F). The current flow is indicated by arrows. Further, the arrows (d_I, d_{II}, d_{III}) give the direction in which commutation must take place, or in other words, the direction in which the jet wave must move at the instant considered; the arrows ($r \longrightarrow l$, and $l \longrightarrow r$, fig. F) serve the same purpose.

Again, at the instant "2" commutator II will be commutating, as its voltage curve is passing through zero. Previous to this time the voltage curve E_{o2} (right) or E_{o5} is negative and its directional flow is $r \longrightarrow l$, and the jet J_{II} must have joined the collecting electrode (*c*) to the main electrode (*b*), fig. A. As with commutator I, at and after the instant "2" the jet J_{II} will have so changed its position that "*c*" is connected to "*a*" (chain-dotted in fig. A) until the time interval "5" is reached, when the play is repeated with commutator II. Therefore, the commutator II commutates $r \longrightarrow l$ (fig. F) at the instant "2," and as indicated by the arrow d_{II}, fig. A The e.m.f. wave E_{o2} is positive; before "2" it was negative and shown as E_{o2} (right) or E_{o5} (fig. C) and had to be com-

mutated to the positive side. These events have been indicated in fig. F by the full line curve (E_{01}) and by the dotted curve (E_{05}).

The proper sequence of voltages can be easily allocated to the other phases. E_{01} of commutator I is, prior to "1" and "2," positive, and its direction will be $l \longrightarrow r$ and J_1 connects, prior to interval "3," "c" to "a" of commutator I; at "3" this commutator must commutate in the direction of the arrow "d_1". At and immediately after this instant the jet J_1 connects as shown dotted, fig. A. Thus the phase sequence is 1-6-2-4-3-5. At any instant three of the phase potentials E_0 are connected in series, their relative phase displacement being 60 deg. Combining them vectorially (fig. H) the resultant voltage is $2\times E_0$, which also corresponds to the amplitude ripples R of the rectified voltage (fig. F). As the maximum e.m.f. of each of the secondary phases is E_0, the mean value, assuming a pure sine-wave is $2/\pi \times E_0 = 0.637 \times E_0$.

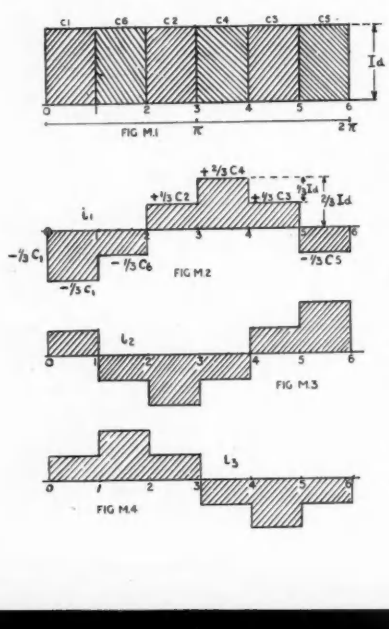


Therefore, each commutator produces a pulsating unidirectional voltage (and current), whose mean value is $0.637 \times E_0$. As the three commutators are series connected, the total mean rectified is $3 \times 0.637 \times E_0 = 1.91 \times E_0$ (fig. F). The value OG is equal to $2 = \times \cos.30° E_0 = 1.73 \times E_0$, and the ripples of the rectified voltage fluctuate between the values of $1.73 \times E_0$ and $2 \times E_0$.

The Current Relations

Fig. K shows a three-phase transformer with Y connected primaries whose secondary phases V_1, V_2. . . V_6 are so joined to the commutators that the correct phase sequence is obtained. The phases V_1 and V_4 are placed on core No. 1, the phases of V_2 and V_5 being 120 degrees displaced against the former must be mounted on core No. 2, and the phases V_3 and V_6 are correspondingly wound on core No. 3.

In the determination of the current relations in the primaries of the transformer it is assumed that the magnetising current and the leakage reactance may be neglected; that the rectified current is smoothed out by large smoothing reactances in the d.c. circuit, and that the ends of the cores, being joined by a common yoke, are at the same magnetic potentials. Let i_1, i_2, i_3 be the instantaneous values of the currents in the primary phases; c_1, c_2 . . . . c_6 those in the secondary phases. The latter are, as seen from fig. M_1, equal to the rectified current Id. Applying the law that the sum of the magneto-motive forces of a closed magnetic circuit is zero at any instant, the relation holds :—



$$t_1 i_1 + t_2(c_1 - c_4) = t_1 i_2 + t_2(c_2 - c_5) = t_1 i_3 + t_2(c_3 - c_6) \quad \ldots\ldots(1)$$

where t_1 are the turns per phase primary, t_2 are the turns of each of the secondary phases V_1, V_2 . . . V_6.

Making the simplifying assumption that the ratio of the turns is unity, the expression becomes :—

$$i_1 + (c_1 - c_4) = i_2 + (c_2 - c_5) = i_3 + (c_3 - c_6) \quad \ldots\ldots(2)$$

Finally, the primary system being Y connected, the sum of the currents is zero at any instant.

With these simultaneous equations it is possible to determine the phase currents of the transformer primary; they are as follows :—

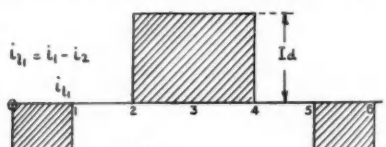
$$i_1 = -2/3c_1 + 1/3c_2 + 1/3c_3 + 2/3c_4 - 1/3c_5 - 1/3c_6 \quad \ldots\ldots(a)$$
$$i_2 = +1/3c_1 - 2/3c_2 + 1/3c_3 - 1/3c_4 + 2/3c_5 - 1/3c_6 \quad \ldots\ldots(b) \quad 4$$
$$i_3 = +1/3c_1 + 1/3c_2 - 2/3c_3 - 1/3c_4 - 1/3c_5 + 2/3c_6 \quad \ldots\ldots(c)$$

When plotting the current diagrams (figs. M_2, M_3 M_4) it is first necessary to fix the correct time sequence of the currents c_1 to c_6, so that during the interval 0—1 the current c_1 will be flowing, during the interval 1—2 the current c_6, until at the interval 5—6 the current c_5 is obtained. Having settled the time, the diagram of the primary i_1 can be drawn. The construction is given by equation 4a. The current values, according to this equation, have been inserted for the correct time intervals in fig. M_2. Repeating with equations 4b and 4c the diagrams of the currents i_2 and i_3 are determined, figs. M_3 and M_4.

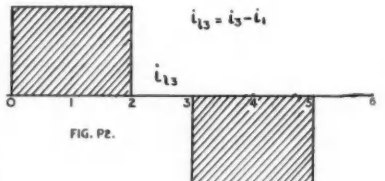
Suppressing Unwanted Components

An inspection of these current diagrams shows that there is not complete balance between the magneto-motive forces of each core. In fig. N "a" represents the difference between the m.m.f.s due to Id and those due to i_1. The trace 1, 2 . . . 6, 7 is a rectangular wave which appears as a ripple superposed on a steady m.m.f.; the ripple has a frequency three times that of the fundamental of the impressed e.m.f. wave. They occur with each limb and, since they operate in the same direction on each core, they produce a magnetisation and voltages which are detrimental to the commutation qualities of the rectifier. There are means by which they can be suppressed.

It is clear that the steady part or d.c. component of curve "a" can produce no corresponding component in the primary or any other auxiliary winding, and only the triple frequency component can react on the primary, inducing there corresponding e.m.fs and currents. Thus, if delta connected auxiliary windings be placed on the cores, triple frequency currents will be flowing in these closed mesh windings, which compensate the out-of-balance m.m.fs and so restore the conditions that the sum of the m.m.fs of a closed magnetic circuit must be zero at any instant.



If, on the other hand, the primary of the transformer is delta instead of Y connected, the auxiliary windings are not required, because then the triple frequency currents will be flowing in the closed mesh of the primary winding and so will supply the necessary compensation. Figs. P_1 and P_2 show the line currents i_{l_1} and i_{l_3} with the delta connected transformer; they are $i_{l_1} = i_1 - i_2$ and $i_{l_3} = i_3 - i_1$.

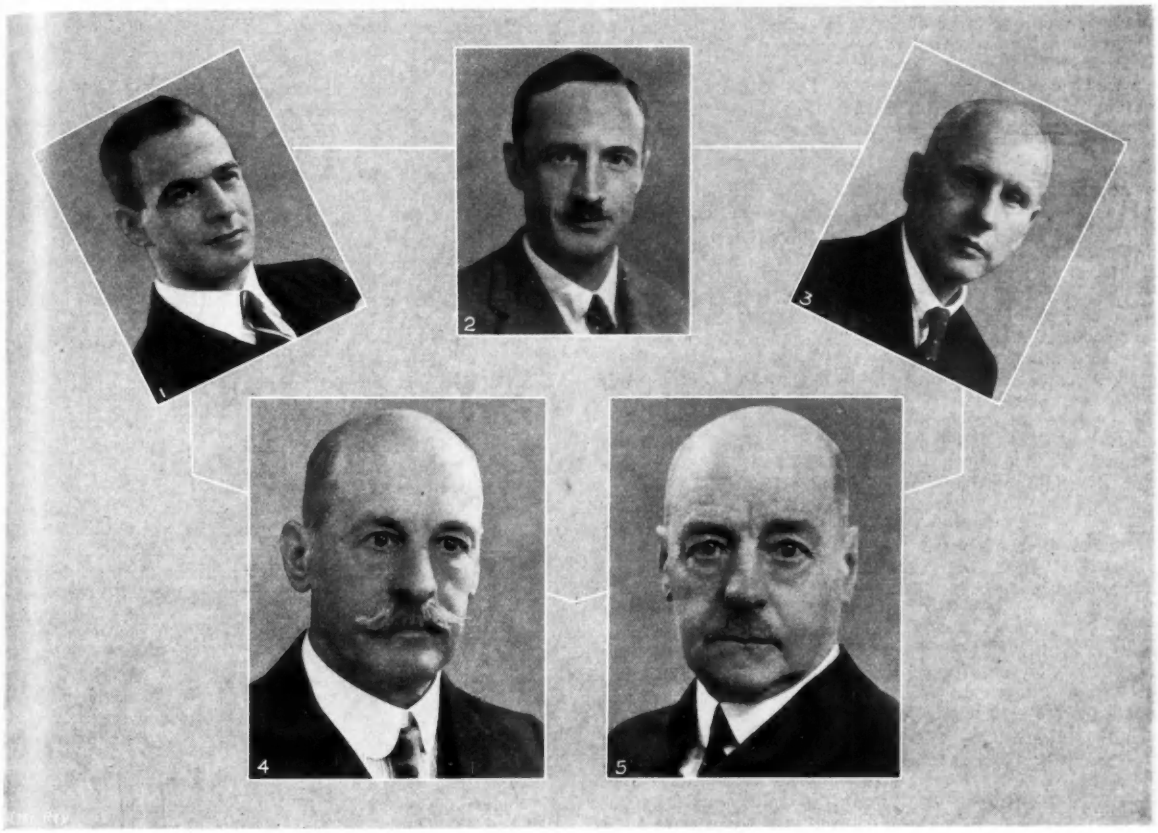


The diagrams are obtained by subtracting the ordinates of fig. M_3 from those of fig. M_2, giving i_{l_1}; and by subtracting the ordinates of fig. M_2 from those of fig. M_4, by which means i_{l_3} is derived.

Tyne Electrical Engineers

The past and present officers of the Tyne Electrical Engineers, R.E., held their annual reunion dinner at Newcastle, on October 28th, when Brevet Lt.-Colonel E. H. E. Woodward, M.C., T.D., M.I.E.E., the commanding officer, presided over a gathering which included several members of the staff of the North-Eastern Electric Supply Co., Ltd. The Honorary Colonel, Colonel Ernest Robinson, C.B.E., T.D., D.L., was also present. Capt. W. H. Treays has been appointed as adjutant in place of Capt. L. E. C. M. Perone, who is shortly leaving Tynemouth.

Some Driving Forces in the Industry: Donovan Electrical Co., Ltd.



1. Mr. J. W. Donovan, B.Sc., A.Am.I.E.E., director. 2. Mr. E. T. G. Donovan, B.Sc., director. 3. Mr. H. Varnom, director. 4. Mr. G. O. Donovan, M.I.E.E., founder and governing director. 5. Mr. W. Donovan, A.M.I.E.E., joint governing director

Consumers' Accounts. By F. H. Fullerton

Dealing with 4,000 meters a day

THE British Columbia Railway Co. supplies electricity and gas in the lower mainland of British Columbia, Vancouver Island, and Kamloops, B.C. The major area hinges round the head office at Vancouver. The meter reading staff consists of a chief reader and fourteen men, who read daily about 300 meters each. There are about 200 sheets in each of 600 meter books, the stiff leather covers of which are reinforced on rainy days by an additional canvas cover made to protect the edges also.

Entries are made from the bottom upwards, to enable the reader to make subtractions on the spot. He can thus see at once whether the consumption is about the average. If his entry is correct he marks "O.K." against the reading; this prevents unnecessary inquiries later. A further advantage of the read-up system is that while the bottoms of the pages are always well thumbed with the constant turning of pages, the reader is working towards the clean part of the page.

The meter sheets are printed on superfine linen so that the rain does very little if any harm. On each sheet are printed the number of the book, the ledger number of the account, a code number which indicates whether the account is domestic or commercial, and a note as to the floor area of the premises on domestic services and kilowatt load in commercial services.

Encouraging Meter Readers

The last two readings from the old sheets are entered on the new sheets, so as to give an idea of the average consumption. The meter reader receives 15 cents for each new application obtained by him. He is also given 15 cents for every maximum demand meter reading made, and 25 cents for every meter which he discovers registering inaccurately.

The books pass from the meter reading department to the billing department, where a set of bills is run through an addressing machine. This prints on each bill the name, address, account number, meter book number, floor area, and other details, thus duplicating everything which is already on the meter book sheets. Then a register sheet is put through a stencil machine. This is a parchment-like sheet of paper ruled as a ledger sheet, and measuring 18 in. by 24 in. The information on this sheet is the same as that on the meter sheets and bills, except that forty accounts, instead of a single account, are recorded on each sheet. An important feature of this system is that accounts can be found instantly, whether in the meter book, bill, or register. The interlocking of all three media with one set of numbers for accounts has proved invaluable in this department, which handles 4,000 accounts each day.

Addressing and Totalling the Bills

The bills pass through the addressing machines at the rate of 3,700 per hour, but as each bill stays for two impressions, one for the bill, and one for the customers' duplicate, the machines have an actual capacity of 7,500 impressions per hour.

The stencil plates drop back into a receptacle in order, and are thus ready for the next printing. In this way the stencil records on the register and bills all the data in which no change occurs from month to month, leaving only the readings and charges to be entered. When a section of bills has been addressed it is assembled in bundles corresponding with the meter books and a time record card is attached. On this card the date of completion of each succeeding step is entered.

The bills then go to a ledger clerk who adds all balances in the columns printed on the top of the bills, which are in the same serial order as the accounts in the ledger. Another clerk then takes over the section of bills and adds any sundries, including such items as appliances purchased on the deferred-payment plan and repair work. The ledger is keyed by a card index system, which enables the relatively small number of accounts dealt with by this clerk to be quickly picked out.

The section is next passed to a clerk who checks their order and sees that serial numbers correspond with those on register sheets. This obviates delay in the billing process through missing sheets. Any irregularities or matters to be brought to the attention of the billing clerk are indicated by means of a code of twenty-five numbers; thus (1) means "not read," (2) "final account," (3) "check reading ordered." This code also serves

to guide counter clerks when customers question the accuracy of their bills.

The bills then reach five Burroughs billing machines, which itemise the bills, record a duplicate of each bill on the register sheet (which thereafter becomes the ledger sheet) and adds all totals. The operators all have a rack on their left-hand side which contains the meter book. The billing machines do not multiply figures, but on the left of each operator is, also, a set of tables showing the amount chargeable for any given consumption.

The operator takes the top bill and drops it into a slotted device which holds it in position. She then taps out the items to be inserted in the bill, including the amount of the previous meter reading, the new reading, the total consumption, and the amounts. To this she adds the balance and sundries (if any) as noted at the top of the page by the two clerks previously referred to. Then the machine totals the bill. At the end of each forty accounts the register sheet is finished off by the machine and becomes a unit in the ledger. When the bills leave the billing machine they are rechecked by a clerk upon a new type of electric calculator, which also confirms the bill sequence and ensures a correct classification of rates.

The checking clerk removes all bills where the consumer has moved, or where the account is to be mailed instead of delivered, as indicated by the code. With the checking completed the bills are taken out by six uniformed messengers.

Methods of Checking

An absolute check is kept on every step by means of the time record which is attached to each group of bills corresponding to the meter books. This card is started when the bills have the addresses stamped on, and is dated and initialled when the sundries and balances are transferred. It is similarly marked when the bills and reading book have been checked, when bills have been extended, sundries checked, and when final check and classification have been made. The series numbers starting and concluding each group of bills and the total number of bills are shown. From this total is deducted the number of bills mailed or requiring correction of address. This card accompanies the messenger, and when he has completed his delivery he marks and initials the total, noting particulars of any bills undelivered. The unit of a bundle of bills is in every case the complete set of accounts in each meter book, and the time record card follows each unit around until the bills are sent out and delivered.

When the bills are made into delivery bundles they are parted from the register sheets for the first time. These sheets are placed in binders in big racks behind the counter and form part of the ledger. There are seventy sheets to each binder, and all binders are numbered and filed in sequence. As there are forty accounts on each sheet this makes 2,800 accounts to each ledger section; this is economical of space without detracting from the efficiency of the ledger.

The cashiers of the collection department are stationed at the two main retail stores of the company at Vancouver, at the counter of the billing department at the head office, and at all branch offices. At the end of the day the cashiers total the amounts received, as shown in the bundles of stubs, by an adding machine and compare them with the total cash receipts. The chief cashier then collects the cash from all points and the day's receipts are made up for banking.

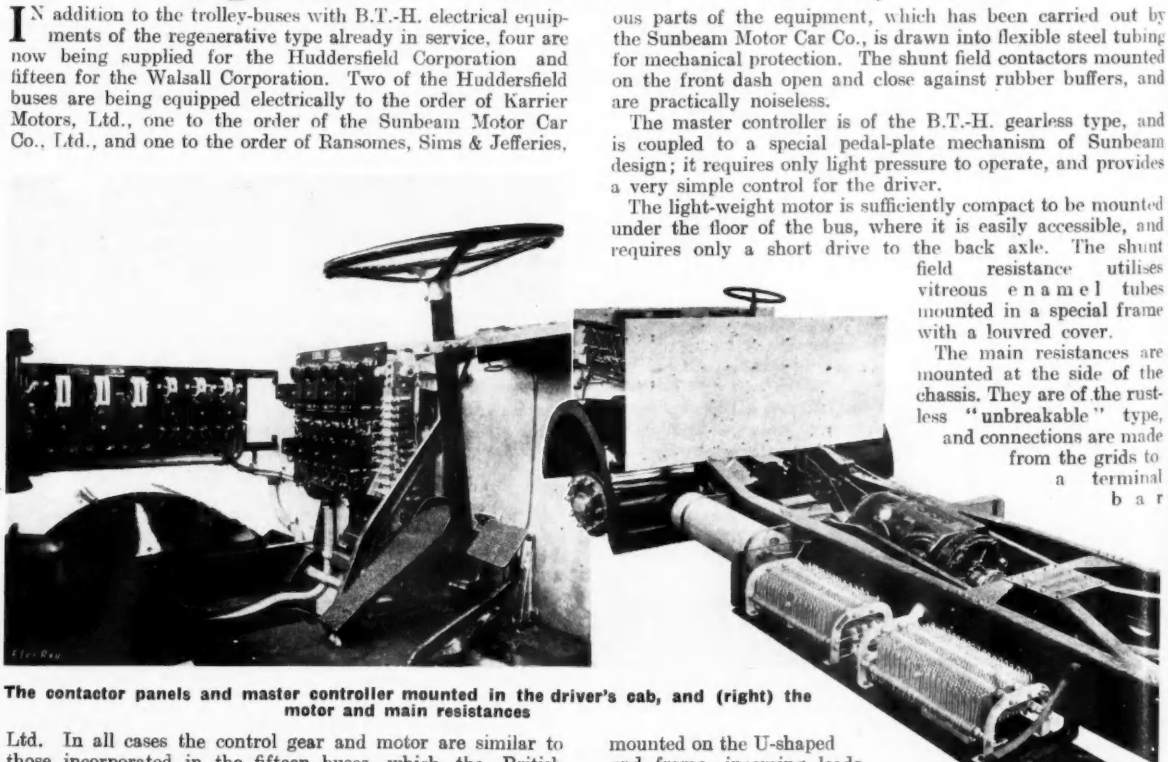
After the stubs have been tabulated by the cashiers they are sent to the sorting department, where they are verified with the cashiers' listings; the bundles are then broken down for sorting and the paid bills are conveyed to the meter-book group of which the account is a unit in pigeon holes numbered to correspond with the meter books. On the carriage of an automatic sorting machine are a number of interchangeable tabs, into which the stubs are sorted. Thus the operator has only to slide the carriage along, pick out the correct numbered tab and slip the bill into it. Three or four of these machines can be placed on an ordinary desk and operated by one girl.

Bundles of stubs in their proper sections are then given to the cash poster, who obtains the register sheets to correspond with all bundles. This clerk works with one of two Burroughs cash-posting machines, which were especially designed for the company in 1929. The postings are made from the stubs on to the ledger sheets, and at the same time an impression is duplicated on a strip of paper in the machine. The machine registers the total for each meter section and at the end of the day gives the total of cash posted. This must agree with the total banked for that day.

Recently an expert who endeavoured to point out additional advantages to be secured by using his company's machines reported that the system at present in use could not be improved on.

Regenerative Control for Trolley-buses

IN addition to the trolley-buses with B.T.-H. electrical equipments of the regenerative type already in service, four are now being supplied for the Huddersfield Corporation and fifteen for the Walsall Corporation. Two of the Huddersfield buses are being equipped electrically to the order of Karrier Motors, Ltd., one to the order of the Sunbeam Motor Car Co., Ltd., and one to the order of Ransomes, Sims & Jefferies, Ltd. In all cases the control gear and motor are similar to those incorporated in the fifteen buses which the British Thomson-Houston Co. has supplied to the Sunbeam Motor Car Co. in connection with a contract which the latter company recently received from the Walsall Corporation.



The contactor panels and master controller mounted in the driver's cab, and (right) the motor and main resistances

The contactor panels and master controller mounted in the driver's cab are arranged for front connection to facilitate wiring and examination. The actual wiring between the various parts of the equipment, which has been carried out by the Sunbeam Motor Car Co., is drawn into flexible steel tubing for mechanical protection. The shunt field contactors mounted on the front dash open and close against rubber buffers, and are practically noiseless.

The master controller is of the B.T.-H. gearless type, and is coupled to a special pedal-plate mechanism of Sunbeam design; it requires only light pressure to operate, and provides a very simple control for the driver.

The light-weight motor is sufficiently compact to be mounted under the floor of the bus, where it is easily accessible, and requires only a short drive to the back axle. The shunt field resistance utilises vitreous enamel tubes mounted in a special frame with a louvred cover.

The main resistances are mounted at the side of the chassis. They are of the rustless "unbreakable" type, and connections are made from the grids to a terminal bar mounted on the U-shaped end frame, incoming leads being brought to a point between the two boxes where all terminals are readily accessible. The resistances are protected from below against ingress of dirt and moisture, but a free passage is allowed for air to pass through from the front for ventilation.

The Commercial Motor Show

Nine builders exhibit a dozen electric trolley-buses

THE eleventh Commercial Motor Transport Exhibition at Olympia (November 2nd to 11th), which was opened officially by the Minister of Transport, clearly demonstrates how the development of trade vehicles has equalled, if not exceeded, that of the private car. In electrical equipment, too, they are almost as complete; dynamo lighting, self starting, electric windscreen wipers, horns, and traffic signals being standard fittings for all classes, but coil ignition is not quite so common as on private cars.

The "mechanical horse" is aptly named, for the manœuvrability of this type of tractor is remarkable. A turning circle of 15 ft. only is necessary for the model made by Scammell Lorries, Ltd., for the St. Pancras Electricity Department for transporting cable drums.

Twelve electric trolley omnibuses are exhibited by nine firms, while the British Thomson-Houston Co., Ltd., has made traction motors and control equipment for buses built by six different vehicle builders, as mentioned below.

The Sunbeam Motor Car Co., Ltd., shows a rigid six-wheel low-loading chassis for a 60-seater double-deck body; a similar chassis with a 58-seater all-metal body by the Metropolitan-Cammell Carriage Wagon & Finance Co., Ltd.; and another with a 50-seater special low height composite body, by the Park Royal Coachworks, Ltd. All three vehicles are fitted with B.T.-H. 80-h.p., 500-V regenerative traction motors and control gear, and Brecknell-Willis lightweight collector gear.

A Special Lighting System

The Sunbeam Company's patented 24-V lighting circuit is arranged so that the battery is only used to supply the small current required to operate the "legal" lights and accessories used regularly, such as screen-wiper, horn, bells, &c., the main current load being supplied direct from a specially wound motor generator, and not from the battery. The motor generator set consists of two distinct insulated machines with a continuous rated capacity of 1,000 W, the dynamo output being at 24 V. The high-voltage portion is entirely insulated from the main frame or body. The size of the battery provided is 40 Ah. During the period the main lights are on and the motor generator is running, the "legal" lights and accessories are supplied direct from the dynamo, and the battery is receiving a regulated charge.

Chas. H. Roe (1923), Ltd., displays a 48-seater double-deck low-bridge-type body with a drop gangway on the top deck off side on a four-wheel chassis by Guy Motors, Ltd., and fitted with B.T.-H. motor and control equipment of the regulated field type. Karrier Motors, Ltd., have a six-wheel chassis for a 60-seat double-deck body, with a 75-90 h.p. B.T.-H. motor and control gear for regulated field operation. The trolley-bus shown by Guy Motors, Ltd., has a six-wheel chassis, with a 56-seat double-deck body by the Brush Electrical Engineering Co., Ltd. There is an auxiliary emergency lighting set beside a 12-V, 10-A dynamo positively driven from the 75-h.p. traction motor, which is of the compound wound regenerative type.

The Brush Electrical Engineering Co., Ltd., shows a single-deck long-distance 32-seater coach on a Daimler chassis, and a double-deck low height 56-seater body on a Leyland chassis, with pillar and roof lamps, electric bell, and illuminated destination indicator. Ransomes, Sims & Jefferies, Ltd., exhibit a double-deck 48-seater trolley-bus similar to that described on the next page, and a six-wheeler with a 60-seat Brush body and B.T.-H. motor; a sample of the new motor of reduced dimensions and weight, with windings arranged for series field regulated control; and a two-ton battery-driven industrial truck having an elevating platform, driven by a separate motor with limit switch. The twenty-cell battery is an I.M.V.4 "Ironclad-Exide."

The Park Royal Coachworks, Ltd., display a double-deck 60-seater body on a Karrier chassis with Walsh trolley gear mounted on the exhibitor's patent system clear of top roof. The Sanders reflector lamps operate at 110 V, and the horn and windscreen wiper at 500 V. The regenerative motor and controller are of B.T.-H. make.

A 63-seat Bus

The English Electric Co., Ltd., has a 63-seater trolley-bus on an A.E.C. type Q chassis. The entrance is at the near-side front, with a front staircase to the top deck, and the seating capacity is unusually large for a four-wheel bus. The 80-h.p. 500-V "E.E. 405" motor has an augmented series field controlled by a group of contactors, which are separately operated by a foot-pedal master switch. The traction and lighting equipment was tested at 3,000 V a.c. for one minute after erection. Also exhibited are a double-deck and single-deck bus bodies, on a Morris chassis, and a single-decker, on a Daimler chassis, all-metal Dick Kerr built.

Weymann's Motor Bodies (1925), Ltd., show a double-deck body on a Sunbeam six-wheel chassis, of patented "metal" construction, and incorporating a special gantry to support the trolley bases. The motor and control gear are of the B.T.-H. regenerative type.

The Gloucester Railway Carriage & Wagon Co., Ltd., exhibits a 54-seat double-decker, with four wheels and Crompton Parkinson electrical equipment. The 75-h.p. motor is behind the rear axle and connected by shaft to the underslung worm-drive axle. The Allen West contactors are in front where the radiator normally is. A 24-V Simms motor-generator lighting set is included.

Morris Commercial Cars, Ltd., fit their 30-cwt. to three-ton vehicles with dipping beam headlamp and electric direction indicators. Heavier vehicles include an end-tipping lorry,

One of the trolley-buses supplied by Ransomes, Sims & Jefferies, Ltd., to Ipswich Corporation. (See next page.)

double-deck bus chassis, and an ambulance. Vauxhall Motors, Ltd., show vans and lorries, and Bedford trucks on a number of body builders' stands.

Garage Equipment

The following concerns exhibit equipment for the care and maintenance of cars, &c.:—R. H. Cook & Co., Ltd. (battery chargers, electric hand tools, lighting plant, switchboards). The Laycock Engineering Co. (lamps). Timson Brothers (car washers, pumps, compressors, plug testers, battery chargers, electrical test benches, electric tools, lamps, &c.). Dunlop Rubber Co., Ltd. (air compressors). Leo Air Compressors, Ltd. (paint spraying equipment and electrical switchgear). East London Rubber Co. (battery chargers, drills, battery shop tools, sparking plug cleaners and testers). Bendix, Ltd. (electrically driven dynamic brake tester, and the Stromberg motoscope—an instrument consisting of a sparkmeter, vacameter, and neon detector tube for tracing ignition and carburettor troubles). Equipment & Engineering Co., Ltd. (electric bells, windscreen wipers, air compressors, washing plant, electro-magnetic crack detectors, hot-air hand driers, vacuum cleaners). E. P. Barrus, Ltd. (electric tools, grinders and metal cutters). Black & Decker, Ltd. (portable tools, valve refacers, polishers and grinders, and a new electric wing straightener). Thos. P. Headland (electric tools, sparking-plug service kit, pedestal lamps, paint sprayers, and compressors). Simpkins Engineering Works (motor-driven car washers). Burma Engineering Co. (electric valve refacers and tools). R. Cadisch & Sons (battery chargers, ignition testers and service tools, floodlighting plant). Harvey Frost & Co., Ltd. (electric brake tester, car lifts and elevators, compressors and inflators).

Newtons of Taunton (tools, test benches, battery chargers and rectifiers, compressors, and a car washer). Joseph Bradbury & Sons, Ltd. (electric brake tester). Tecalemit, Ltd. (electric grease guns, gear flushers, washing and vacuum plants, compressors). Tangyes, Ltd. (compressors, car washers and paint sprayers, including mobile sets on wheeled trucks). C. Lindley & Co., Ltd. (electric tyre inflator, battery chargers, lathes and tools). British Pneumatic Tools, Ltd. (electric compressors, paint sprayers, and tyre inflators). Romac Motor Accessories, Ltd. (portable electric compressor). Brown Brothers, Ltd. (electric lighting plant, car washers, tools and accessories). W. Turner & Bro., Ltd. (compressors). Skefko Ball Bearing Co., Ltd. (ball and roller bearings, including types for magnetos). Barrett, Tagant & Gotts, Ltd., display greases, lubricants, and lanoline base rust preventives.

In the accessories section the Chloride Electrical Storage Co., Ltd., shows lighting and starting batteries, including a flat-plate type specially developed for heavy-oil engines. The Edison Swan Electric Co., Ltd., exhibits accumulators for the first time at this show, also " Tungar " and other valve rectifier battery chargers.

Other firms with displays of accessories include Mansell & Adams, Ltd. (lamps and switches). Mechanical & General Inventions Co., Ltd. (" Solcar " head fittings, providing open or closed coach, operated by a small electric motor). Dover, Ltd. (sparking plug testers). Westinghouse Brake & Saxby Signal Co., Ltd. (air brakes and compressor with driving motor combined in one frame). G. D. Peters & Co., Ltd. (motor-driven compressors for trolley-bus air brakes, " Plastic Arc " welding outfit, and electrodes).

Ceag, Ltd. (" Lumax " car lamp bulbs, double filament for dipping devices, and other special types). C. L. Jones (electric arc welding for construction and repairs). Homo, Ltd. (aluminium-steel tail lamps). Romac Motor Accessories, Ltd. (lighting requisites). Talbot Anti-Dazzle Cone, Ltd. (lens units for fog lamps). Boyce Motor Accessories, Ltd. (lighting, ignition, and starter components). Ioco Rubber & Waterproofing Co., Ltd. (insulating materials for magnetos—cloths, silks, tapes). Wilmot-Breeden, Ltd. (roof lamps, ignition locks, &c.). Desmo, Ltd. (" Safebeam " anti-dazzle lamps). H. M. Hobson, Ltd. (battery water gauge, sparking plugs).

C.A.V.-Bosch, Ltd. (dynamos and motor-generators for lighting, illuminated instrument panels, lamps, horns, switches, windscreen wipers, and batteries). Joseph Lucas, Ltd. (lighting and starting sets, magnetos and coil ignition outfits, switchboxes, lamps of all kinds, horns, batteries, windscreen wipers, and direction indicators). S. Smith & Sons (Motor Accessories), Ltd. (instrument panels, direction indicators, cigar lighters, lamps, windscreen wipers, sparking plugs). Scintilla, Ltd. (magnetos, dynamos, starters, alternators for lorries and tractors, switchboards, lamps, coil ignition sets, indicators, and windscreen wipers). Ross, Courtney & Co., Ltd. (electrical terminals and jointing devices). Flexible Lamps, Ltd. (rubber tail, number plate, and signal lamps).

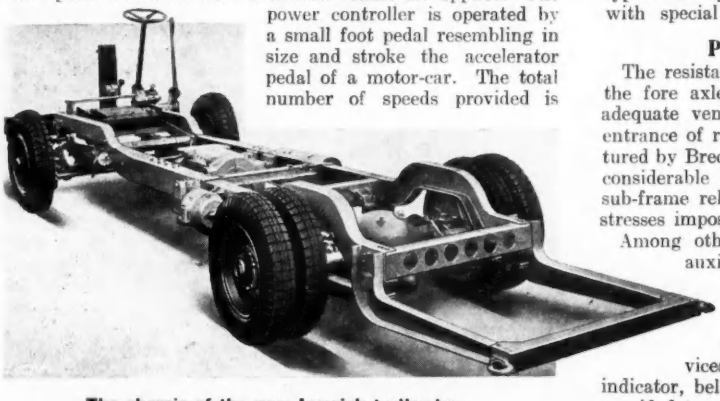
Klaxon, Ltd. (hooters and horns, push-button switches, direction indicators, and miniature motors). Rotherham & Sons, Ltd. (electric oil indicators). British Thomson-Houston Co., Ltd. (magnetos, impulse starters, automatic ignition timing devices, and lamps). Bluemel Bros., Ltd. (" Beamlight " rear lamps). J. Stone & Co., Ltd. (battery water distillers, electro-megaphones and loud-speaking telephones). Ripaults, Ltd. (automobile cables and wiring, insulating materials, cable clips and terminals, ignition sets, and batteries). Service Recorders, Ltd. (electric chart recorders for showing engine and vehicle running and stoppage times). Simms Motor Units, Ltd. (magnetos, coil ignition outfits, starters, battery testers, magneto repair tools, dynamos, and magnetic oil filters). Pirelli, Ltd. (electric wires and cables).

Batteries are also shown by the Young Accumulator Co. (1929), Ltd., the Tungstone Accumulator Co., Ltd., Britannia Batteries, Ltd., Batteries, Ltd., and Oldham & Son, Ltd.

Trolley-Buses for Ipswich

FOUR double-deck electric trolley-buses, which are to be put into service by the Ipswich Corporation next month, have been built by Ransomes, Sims & Jefferies, Ltd.

The four-wheel chassis is of the two-axle single motor type, the motor being in the middle. The system of control has special automatic features, and is so combined with the air-operated foot brakes that regenerative braking automatically takes place whenever the mechanical brakes are applied. The power controller is operated by a small foot pedal resembling in size and stroke the accelerator pedal of a motor-car. The total number of speeds provided is twelve, of which eight represent economic speeds which can be used without waste of energy in resistances.



The chassis of the new Ipswich trolley bus

The motor is of Ransomes' own design and is rated at 80 h.p. in accordance with British Standard Specification, compound-wound and enclosed ventilated. Its ratio of horse-power to pounds weight (11 : 2) shows the extent of recent advances in this direction. The saving in weight is obtained by special attention to ventilation, the use of light-weight alloys and modern methods of manufacture, full use being made of the advantages afforded by electric welding. The size of the motor is such that, although placed under the floor of the saloon, the height of the latter from the ground is not increased, while a short direct drive is obtained.

The transmission is by means of the Ransomes-Garrett patent tubular telescopic propeller shaft and universal joints. Special attention has been paid to the brakes which employ large diameter " Walloy " cast drums, there being two sets of shoes to each driving wheel, both sets acting in one common drum. A hand brake of the usual ratchet pattern for " parking " purposes is also provided. The steering is of the Marles type. The springs are of the flat laminated pattern provided with special leaf lubrication.

Power Transmission and Braking

The resistances are carried in the front of the vehicle over the fore axle beneath the floor of the driver's cab, where adequate ventilation is obtained without the danger of the entrance of rain, mud, and dust. The trolley gear, manufactured by Brecknell, Willis & Co., is also a new design whereby considerable weight reduction has been effected. A special sub-frame relieves the roof of the vehicle of the weight and stresses imposed by the trolley gear.

Among other interesting features may be mentioned the auxiliary 12-V lighting system, the generator being directly coupled to and driven by the main driving motor. By this means properly focused head lights of the motor-car pattern can be employed and the auxiliary devices, such as horn, wind-screen wiper, direction indicator, bell, &c., can be operated. Special choke coils are provided to prevent interference with wireless reception.

The body, which is of Ransomes' standard construction, is arranged to seat forty-eight passengers, twenty on the lower deck and twenty-eight on the upper deck. The exterior panels are of aluminium and the seating is built on Dunlop " Latex " foundations in hand-buffed hide. Three windows on each side in each saloon are arranged to drop, these being controlled by G. D. Peters & Co.'s Windsor fittings. Efficient ventilation is provided. A wide entrance platform is provided at the rear, and the rear bulkhead is cut back to form an emergency exit to the lower saloon. Also the rear bulkhead window in the top saloon forms an emergency exit.

The chassis is illustrated herewith; a general view of the new vehicle appears on page 659.

A Pioneer Steam-electric Locomotive

IN view of the interest which is at present being shown in Diesel-electric locomotives in this country and on the Continent, the August issue of the *Brown-Boveri Review* recalls the interesting fact that as long ago as 1896-97 the authorities of the Western Railway of France carried out experiments with a locomotive known as the Heilmann. The machine was provided with a Willans-Robinson six-cylinder steam engine developing 1,350 h.p. at 400 r.p.m. and driving two d.c. generators connected up in parallel, direct-coupled to the two shaft ends of the steam engine and operating at about 450 V. The whole power station equipment rested in a frame which was carried on two four-axle bogies. All the eight axles were equipped with 125-h.p. series-wound driving motors running at 450 r.p.m., corresponding to a speed of about 60 m.p.h.

Apart from the basic principle of the locomotive, namely, a power station on wheels, the engine possessed a number of features which even to-day would be regarded as thoroughly modern. When the load changed, the speed of the main steam engine was changed by influencing its regulator from the driver's cab. The motors were designed with hollow shafts and the motor housings firmly secured to the bogie. The hollow shafts transmitted the driving torque to the spokes of the driving wheels through the agency of compression springs. The electrical equipment for the locomotive was designed and constructed by Brown, Boveri & Co.

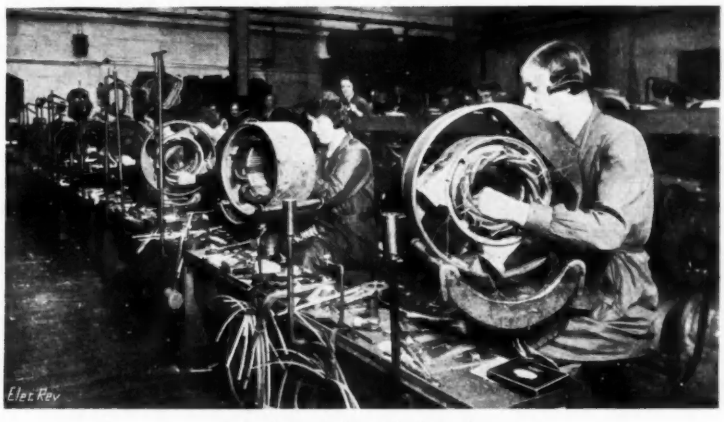
Some of our readers will remember the numerous and complete descriptive articles on the Heilmann locomotive which appeared in the ELECTRICAL REVIEW many years ago.

Motor Developments

A visit to Messrs. Brook's works at Huddersfield

WE paid a visit this week to the Empress Works of Brook Motors, Ltd., Huddersfield, and inspected the many processes which are involved in the manufacture of electric motors. At the same time, we particularly examined a number of the more recent and special products

It seems that the special "S" motor is an effort to divert attention from the price-cut apparatus—an excellent move. It has, with respect to standard equipment, a larger fan and greater space behind the windings, a longer core, much bigger lubrication housing, special holding nuts with blank ends, mica insulation throughout, all in addition to a high-class finish, both inside and out. It is shown that the running cost of a special 4-h.p. "S" motor for fifty 50-hour weeks at 75 per cent. full load, with electricity at 1d. per kWh, is £28 12s., as against £31 13s. 6d. for an ordinary motor of similar size; the initial cost of the Brook "S" machine is £12 12s., as against £10 9s. for a Brook "R" motor.



A section of the winding shop

"Capacitor" Starting

The "Capacitor" starter has been developed still further to improve the starting torque of the company's special high starting torque motor. It permits the retention of the cage-type rotor in the motor, and it is really a two-position switch which, in the starting position, connects a "capacitor" with the starting winding in such a way that a two-phase circuit with two-phase starting characteristics is formed. In the running position the capacitor is used for raising the power factor, while it also increases the efficiency and overload capacity of the motor. Actual starting torque is from 50 to 100 per cent. of full-load torque. The motor runs much more quietly, and the switchgear is simplified.

The company's "R" motor is modified to suit the special starter, and both motor and starter must be considered as essentially a joint equipment. The starting winding on the motor has a definite number of turns to permit, with the capacitor connected in series during the starting period, a phase lead of nearly 90 deg. over the current in the running winding. Sizes from ½ to 10 h.p. are available for 200 V, and up to 30 h.p. for 400 V.

The surface-cooled motor has the actual stamping surfaces presented to the outside air, with external radiating fins, and it has about double the length of stampings in the core, compared with a standard motor. A hood over the fan, at the pulley end in the case of the slip-ring motor, directs the air over the exterior.

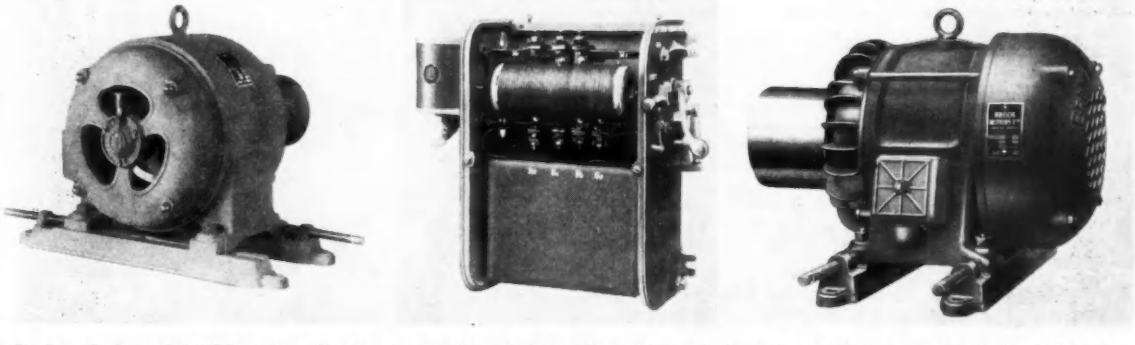
Built-in Motors

Business in the "built-in" motor is increasing considerably, and its use is no longer confined mainly to woodworking machinery. A driving unit for the shoe trade has incorporated in it two ¾-h.p. motors, each directing driving cutters and fitted with hand brakes. The result is a saving in the very considerable belt losses and belt maintenance. The motors run at 10,500 r.p.m., and we were told that a motor for 18,000 r.p.m. was produced recently for a woodworking machine. In the "special display" we saw a drill motor reversing thirty times per minute continuously, a 3-h.p. motor running at 3,000 r.p.m. on a lightly sprung bed without perceptible vibration, and motors running at all fixing angles from upright to upside down. Actually employed in production work we saw a grinding machine with a 5-h.p. built-in motor driving a wheel weighing half a ton. It was surfacing the studs on face-plate starters. Another machine with built-in motors which we saw actually in the works is an Asquith driller with two motors, one for lifting the arm and one driving the drill. Twelve speeds are provided for the drill, from 27 to 1,000 r.p.m.

For assembled and "built-in" high-speed motors standard frequency changers are now available with motor sizes up to 30 h.p., and secondary frequencies up to 125. A V-belt driving unit is sold complete with slide rails. The motor pulley has grooves for the V belts, but the belts drive directly on to the flat surface of the countershaft pulley.

In the exhibition room we saw a motor of the surface-cooled type that had run under water continuously for three years, and a half section of a 20-h.p., 750 r.p.m. three-phase, slip-ring motor, similar to a model which is on permanent exhibition at the Science Museum, South Kensington.

It would not be wise to attempt to describe in detail any of the many processes seen in the casting receiving bay, brass and aluminium foundry, winding department, testing corner, starter shop, and other departments, after a comparatively short visit, but almost the last thing we saw in the works proper was a man "digging" out the windings of a motor in for repair, and it seemed to us, at any rate from the point of view of time, that he had a much bigger job on than had the girls who were putting the windings in new motors.

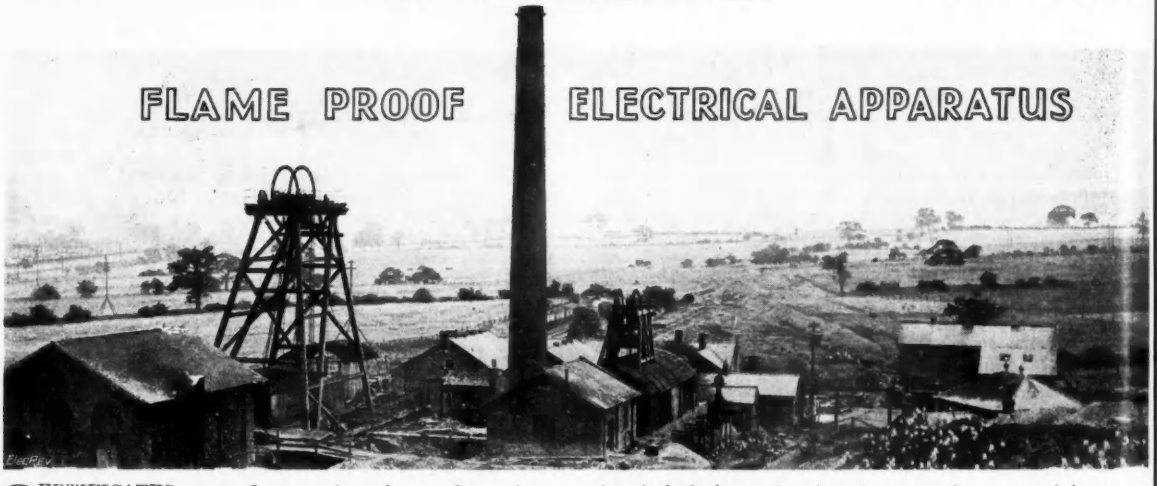


Left: A typical special "S" motor. Centre: A capacitor starter with resistance to limit the starting current to twice full load. Right: A surface-cooled motor

The Analysis of Coal and Coke

A Fuel Research Survey Paper (No. 29) dealing with an investigation into the accuracy of routine analytical determinations on coal and coke has just been published by the Department of Scientific and Industrial Research (H.M. Stationery Office, 9d. net.). Modern conditions and processes demand a high efficiency, only to be achieved by careful selection of the coal used. Further, it is now generally recognised that the only satisfactory basis on which coal can be bought and sold is its chemical constitution and its heat-giving power.

FLAME PROOF ELECTRICAL APPARATUS



CERTIFICATES as to flameproof enclosure have been issued by the Mines Department in respect of the following apparatus during the nine months ended September 30th, 1933. The certificates apply to atmospheres containing firedamp except where otherwise stated :—

Anderson Boyes & Co., Ltd.—70-A, 650-V air-break gate-end circuit-breakers and assembly to form a switchboard by coupling units by c.i. adaptors.

British Electrical & Allied Manufacturers' Association.—Tank for oil-immersed or air-cooled (dry) 5-kVA, 3.3-kV single-phase transformer.

British Jeffrey-Diamond, Ltd.—(1) 100-A, 650-V air-break circuit-breaker; (2) 100-A B.S. plug and socket 650-V connector with pilot contacts for electrical interlock.

British Thomson-Houston Co., Ltd.—(1) 12-h.p. 650-V 3-phase conveyor motor with electrically interlocked 3-A plug or with terminal assembly with conduit elbow; (2) 2.5-h.p. 550-V, 3-ph. s.c. conveyor motor; (3) 23-h.p., 650-V, 3-ph. s.c. conveyor motor, conduit elbow fitted to terminal cover on end shield; (4) single-phase petrol-pump motor for non-standard frequencies; (5) ½-h.p. 2- or 3-ph. petrol-pump motor for 50 cycles.

Brook Motors, Ltd.—10-h.p., 400-V, s.c. motor, with rotor terminal box as sealing box for compound.

Bruce Peebles & Co., Ltd.—Slip-ring enclosure, 100 A, 312 V.

Consolidated Pneumatic Tool Co., Ltd.—0.9-h.p., 125-V, 3-ph. coal-drilling machine, with s.p. switch for remote control at 15 V.

Cowlishaw, Walker & Co.—27-h.p., 500-V coal-cutter motor and starter, with mechanically interlocked plug and socket.

Electrical Apparatus Co., Ltd.—(1) Control panel for d.c. motor, max. 60 h.p., 600 V; (2) inductor control panel, 150 A, 3,500 V, with auxiliaries in rectangular welded steel enclosure; (3) 150-A, 650-V a.c. inductor control panel.

George Ellison, Ltd.—(1) 60-A cable link box with two compound-filled dividing boxes for 2-, 3-, or 4-cored armoured cables; (2) plug box for one or two B.S. plugs in association with electrical or mechanical interlocks; (3) 60-A, 660-V plug and socket coupling, five-pin non-reversing interior with electrical interlock and including the necessary provision for mechanical interlock.

English Electric Co., Ltd.—(1) Mining-type relay, cable entry by four insulating stems in rear of c.i. casing; (2) 600-A 1,000-V ribbed c.i. slip-ring enclosure for attachment by pedestal bearing.

Foster Engineering Co., Ltd.—Tank for oil-immersed bell-signalling transformer, 100 W, 110/550 V to 25 V, for compound filling or for air insulation.

Wilfrid Francis & Co., Ltd.—(1) 60-A plug and socket up to 650-V mechanically interlocked with associated switch; (2) 60-A, 650-V plug and socket for atmospheres containing petroleum vapour.

Fraser & Chalmers Engineering Works.—(1) Contact box and compound coil box for 375-W screen vibrator; (2) enclosure for 10 μF condenser for screen vibrator in atmospheres containing petroleum vapour.

General Electric Co., Ltd.—(1 to 3) 5-, 10-, and 25-h.p. 550-V, 3-ph. s.c. motors; (4) 200-A, 750-V c.i. slip-ring enclosure; (5) air-break reversing controller for 550-V a.c. and d.c. motors up to 100-h.p.; (6) 75-A, 650-V c.i. slip-ring enclosure; (7) 5-h.p., 500-V, 3-ph. s.c. motor with ribbed stator frame and non-driving end cover extended to form terminal box.

Horner, Green & Co., Ltd.—3-h.p. 400-V, 3-ph. coal-cutter motor, with c.t.s. cable gland.

Greenwood & Batley, Ltd.—8-h.p. 60-V traction motor.

Heyes & Co., Ltd.—(1) 100-150-W well-glass lighting fitting with ribbed casting, terminal box and glass-retaining flange in c.i., the well glass being cemented into flange by "Pioneer" plaster; (2) 60-W well-glass lighting fitting, glass cemented into retaining flange, with ribbed upper casting and rectangular joint box.

Lancashire Dynamo & Crypto, Ltd.—(1) ¼ h.p., 230-V d.c. or single-phase petrol-pump motors; (2) 35-h.p. 3 300-V 3-ph. s.r. motor; (3) 5-, 9-, 20¾-, 31½- and 47½-h.p. (per 1,000 r.p.m.), 650-V d.c. motors; (4) 5-, 10-, 17½-, 28- and 38-h.p. 650-V "Maxtorq" 3-ph. motors, with cable entry by electrically interlocked plug and socket, for atmospheres containing petroleum vapour.

Laurence, Scott & Electromotors, Ltd.—(1) 12-h.p., 500-V, 3-ph. s.c. motor, combined with non-reversing straight-on starter with electrically interlocked 30 A plug; (2) 10- and 15-h.p., 400-660, 40 to 50-cycle s.c. motors, with reversing-type starter, and electrically interlocked 100-A plug; (3) 48-h.p., 525-V d.c. motor, with "Emcol" air circulation; (4) 10-h.p., 420-V d.c. motor with external fan; (5) 100-A, 600-V gate-end switch, comprising 3-ph. air-break contactor with isolating and reversing switch, auxiliary "on-off" switch, and 100-A B.S. plug; (6) straight-on non-reversing a.c. starter, with electrically interlocked B.S. plug and socket, 10 to 30-h.p., 600-V, 50-A max. for end-cover mounting on a.c. motors; (7) 30-h.p., 625-V, 3-ph. s.c. motor, with "Emcol" tubes welded to six segmental sections; (8) 40-h.p., 500-V d.c. motor with "Emcol" cooling tubes.

Macintosh Cable Co., Ltd.—Cable-end sealing coupling boxes of cast brass for three-core cables, max. 0.1 sq. in., 150 A, 3,300 V, or 0.06 sq. in., 100 A, 3,300 V.

Marconi International Marine Communication Co., Ltd.—Automatic distress-call contactor enclosure, 0.5 A at 24 V, suitable for atmospheres containing petroleum vapour.

Metropolitan-Vickers Electrical Co., Ltd.—(1) 2½-, 5-, 12-, 23-h.p., 440-V, 3-ph. s.c. conveyor motors; (2) combined stator and rotor starter, 60 h.p. at 650 V, comprising 3-ph. air-break contactor drum controller and isolating switch; (3) 100-A, 650-V malleable c.i. distribution box, with emergency trip switch in association with electrically interlocked 100-A B.S. plug and socket; (4) tank for single-phase 5-kVA, 3,300-V oil-immersed or air-cooled (dry) transformers; (5) slip-ring enclosures for motors up to 1,000 h.p.; (6) 50-h.p., 400 to 650-V air-break gate-end switch with contactor, reversing isolating switch, and 100-A B.S. plug and socket with pilot for remote control.

Mining Engineering Co., Ltd.—60-A, 660-V, 3-ph. reversing or non-reversing starters for side or separate mounting on a.c. motors.

A. Reyrolle & Co., Ltd.—Draw-out pillar-type switchgear for 200, 400, and 600 A up to 3,300 V, 200 A up to 6,600 V; (2) oil switch or transformer (up to 3 kVA, 125 V, secondary) and fuses, with contactors and thermal trips in switch hoods; (3) 15-A, 125-V, 3-ph. air-break reversing drill switch; (4) 60-A, 660-V "flit-plug" connector; (5) 100-A, 660-V B.S. plug and socket connector with pilot contacts for electrical interlock and provision for mechanical interlock; (6) 60-A, 660-V air-break gate-end 3-ph. switch, with "flit-plug" and electrically interlocked B.S. plug and socket, and assembly to form switchboard; (7) two-stage delayed withdrawal plug and socket, 15 A, 440 V a.c., and 15 A, 230 V d.c., with "Pliagrip" armour gland and interlock earthing cap, for atmospheres containing petroleum vapour; (8) 200-A, 660-V bolted cable coupling, comprising two flit plugs; (9) 60-A, 660-V, 3-ph. oil switch with transformer (up to 5 kVA, 125 V secondary) and fuses.

J. G. Statter & Co., Ltd.—60-A, 660-V a.c. air-break circuit breakers, with two electrically interlocked 30-A plug and socket connectors.

Switchgear & Cowans, Ltd.—(1) Draw-out pillar-type oil-immersed circuit breakers with compound-filled switch hoods and bus-bar chamber, rated for 60 A at 3,300 V and 120 and 200 A at 650 V, with relays and/or ammeters and current transformers; (2) 60-A, 550-V, 3-ph. oil-switch, with interlocked plug and socket for earth continuity control.

The picture at the head of this article shows the Avenue Colliery, Chesterfield.

The E.I.B.A. Birmingham Dance

The annual dance organised by the Birmingham and district branch of the Electrical Industries Benevolent Association was held on November 3rd at the Magnet Club, Witton. The president of the association (Lord Meston), with Captain J. T. Keeping, the secretary, represented the parent body, and others present included Messrs. F. W. Martin (chairman of the Birmingham and District Centre), S. T. Allen, W. Donovan, J. Birkett, H. N. Whitford, H. Hooper, and R. M. Verity and Dr. C. C. Garrard.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

The Grid's Secondary Network

THE lower-voltage sections of the national interlinking grid system are described in the paper by Mr. C. W. Marshall which was read before the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 9th. Main constructional features and data relating to the general design of overhead lines (with typical costs), cables, switching and transforming stations, and protective equipment are given in some detail by the author.

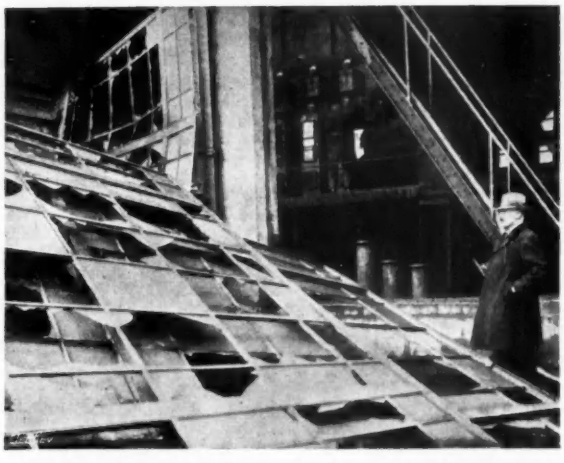
There are 221 circuit miles of 66-kV lines with thirty-three transforming and switching stations, the total transformer capacity being 1,193,000 kVA. There are also 1,319 circuit miles of 33-kV lines with 152 transforming and switching stations, the total transformer capacity being 1,134,450 kVA. Circuit capacity ranges from 40,000 kVA at 66 kV to 1,500 kVA at 11 kV and transformer capacity from 45,000 to 50 kVA. Switchgear of every standard rupturing capacity has been used from 1.5 million kVA downward, and overhead lines are employed in preference to cables because of their economy at all voltages, the standard conductor material being steel-cored aluminium.

Ring mains or double-circuit lines with duplicate transformer and line supplies are standard wherever loads justify duplication. Line route maps and switching diagrams are included in the paper. The relative performances of conductor joints of all types are being determined by conductivity sets. So far it has not been necessary to use special anti-fog or anti-dirt insulators on the lower-voltage lines, but on certain lines immediately adjoining the sea coast the maximum number of standard insulators has been provided from the outset. Experience to date indicates that this provision will be adequate to prevent surface flash-over; in certain areas insulators need periodic cleaning. Ageing tests are to be applied to sample insulators after they have been in actual service for three, five and seven years.

Lattice steel towers of eight standard types are used for all the C.E.B.'s 66- and 33-kV lines, with the exception of one 33-kV line which is on centrifugally cast concrete poles. Not more than four towers per mile of route are earthed, the overhead continuous earth wire being metallically connected to each tower. Underground cables have been laid only where their use could not be avoided. Single-phase solid dielectric, single- and three-core oil duct, and gas-pressure three-phase types are in use.

All transformers are three phase; those above 10,000 kVA have air-blast cooling above half load, and ratio changing is done on-load above 2,000 kVA. The Central Board's experience shows that transformers may be connected directly to 33-kV lines without impairing the continuity of supply.

The most important 66-kV switching centre, with circuit breakers of 1.5 million kVA, is unattended and remotely controlled, the unit price per circuit being £5,809. The cost of equipment for the simplest form of 33-kV line tapping through an oil-immersed isolator, without automatic circuit breakers, was £291 per circuit.



This picture, taken after the recent mishap at the Peterborough power station, gives the impression of an explosion of some magnitude, but Mr. H. A. Nevill, the borough electrical engineer, assures us that little serious damage was caused. The matter is commented on in our leader section

The Choice of Sub-station Switchgear

SUB-STATION switchgear for use at from 3,300 to 33,000 V was the subject of the paper by Mr. J. R. Mortlock which was read before the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on November 7th. The oil-immersed circuit-breaker is reviewed in some detail; types of contact and methods of arc control are described. As rapid closure is essential, electrical or mechanical operation is deemed to be preferable to manual, and the importance of regular and adequate maintenance is emphasised.

A 45,000-kVA 66/6.6-kV Hackbridge transformer going into the Stepney grid sub-station. The e.h.p. switchgear is of Reyrolle manufacture and the 6.6-kV gear by Ferguson, Pailin, Ltd. The transformer weighs about 100 tons

Oil-less circuit-breakers have met with a fair measure of success, but both the water-vapour and air-blast types are said to be more expensive and to require more maintenance than the oil-filled variety.

For outdoor use metal-clad switchgear has advantages and greater flexibility, though the open type should not be neglected. For indoor use metal-clad gear involves a larger initial outlay, but less space is needed, while installation and maintenance costs should be less, interlocking simplified, and safety increased. Extensions and modifications are not so simple when compound-filled bus-bar chambers are employed, but in this respect there is little to choose between cellular gear and oil-filled chambers with metal-clad gear. Heavy current difficulties, above 2,000 A, are more easily overcome with cellular gear.

The author's final choice is a simple design of metal-clad gear of the horizontal withdrawal type, with duplicate bus-bars of 130 per cent. of the present capacity requirements. On-load selection with single circuit-breakers is favoured, but no bus-bar sectionalising equipment, the cost of which would probably not be justified. All circuit chambers should be oil-filled and the breakers should have tested arc-control devices; they should be remotely operated in conjunction with an automatically operated mimic system diagram. Important circuits should have Merz-Price protection with cheaper systems on other circuits.

Should Technical Education be Centralised ?

THE centralisation of higher technical education in the interests of economic development and the advantages of day class compared with evening class instruction were commented upon by Prof. E. W. Marchant in an address at Wolverhampton on November 3rd, in connection with the prize distribution to students of the WOLVERHAMPTON AND STAFFORDSHIRE TECHNICAL COLLEGE.

Prof. Marchant said that the provision of the highest type of technical education for those who could only spare time to attend classes in the evening was a matter of very considerable difficulty. If such instruction was to be given in subjects like electrical or mechanical engineering it was essential that laboratories fitted with a wide range of equipment and measuring appliances should be available, but it was impossible for

small towns to make provision of this kind. The financial resources available for providing such instruction were limited, and there was no reason why large sums of money should be spent on equipment which could only be used by a comparatively small number of students. It seemed almost self-evident that a policy which encouraged the centralisation of the higher work in a small number of well-equipped colleges was a more efficient way of dealing with this problem. Was it not more economical to provide travelling facilities for a small number of advanced students from a large area and thus make it unnecessary to build expensive laboratories in smaller towns? If even-

* * *

Cable for 11-kV Distribution

Can underground cables be used economically for 11,000-V distribution? Mr. P. V. Hunter, president, attempted to answer this question at the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on October 30th. The well-attended meeting showed itself fully alive to the possibilities of this system. The subsequent discussion dealt mainly with the technicalities of cable laying, and the advantages of underground transmission over those of the overhead system on the score of reliability and freedom from causing interference. Mr. Hunter made a strong appeal for the adoption of one, or at most two, standard sizes of cable, and declared that large reductions in cost would quickly result if cable makers knew that they were at the end of the era of small orders for short lengths of a hundred and one sizes and types of cables. He said the case for underground cable transmission in rural areas had not received adequate consideration, and too often comparisons of cost were made for areas and conditions very different in soil and climate. He suggested for rural England the adoption of a standard three-phase cable 0.05 sq. in. 11 kV, lead covered, taped and compounded, thereby eliminating all variation of size and shape. Mr. W. J. H. Wood said there were many districts served by electricity only because overhead transmission had made it possible, but such a position had now been reached that underground cables could best take up the work. The time when overhead lines would only exist in remote and wild districts was now in sight.

Automatic Electric Lighting Plants

In the Physical Laboratory of Trinity College, Dublin, on November 2nd, Mr. F. C. Porte, the newly elected chairman of the Irish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS, gave his opening address. He described several types of small automatic electric lighting plants, including the Kohler plant, which provides direct lighting without the use of a battery. A floating storage battery is used by the Lister and Petter firms, while the Austinlite type employs a larger battery for lighting, and the engine is used only for charging the battery automatically whenever necessary. Mr. Porte said that with a modern Diesel type engine electricity could be produced by a private owner at a total cost of 1.17d. per kWh, while with a petrol engine the price would be over 2d. per kWh. The lecture was illustrated by a number of lantern slides showing the types of installations referred to, and graphs giving details of their performances.

Electricity for the Farmer

The use of electricity in rural areas was now a matter of salesmanship, said Mr. A. L. Cain in a paper presented at a meeting of the London Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS, while installation costs required thorough investigation. Electrical implements were much more efficient and quicker to operate than the old equipment used by farmers hitherto. They were also very much smaller, which gave farmers the idea that they should be less costly in proportion. Electricity suppliers had now to prove that this was actually the case, taking into consideration the running and maintenance costs. The greatest difficulty was the initial cost of the installation. Hire or hire-purchase was the only way of overcoming this problem. To make this method of purchase a success, the terms must be very attractive. Although the farmers' load was an important one, the domestic consumers must not be forgotten. When dealing with village people, entirely different methods were required from those practised in the towns; their earning and, consequently, their spending capacity was very low. A rental of 10s. per quarter for cookers was far too high, and hire-purchase could be definitely ruled out.

ing class instruction were replaced by instruction in the daytime, it would mean a great improvement in the training of the student; he would be taught at a time when he was alert instead of at a time when he was mentally and physically tired, and the fact that men were so engaged would enable works to absorb a number of employés who would otherwise have nothing to do.

Such a course would involve much readjustment and reorganisation, but it had been done in several works and had met with a large measure of success and it appeared capable of extension to cover other cases.

Recent Metallurgical Developments

In the second Andrew Laing lecture, delivered at Newcastle-on-Tyne on November 3rd, before the NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS, Prof. F. C. Lea dealt with recent metallurgical developments and their significance to shipbuilding and marine engineering. No reference is made to the growing use of X-rays for investigating crystal structure and faults in materials, but Dr. Lea thinks it is not improbable that X-rays will prove an even more useful tool than the microscope in the future in assisting the metallurgist to improve existing materials and to indicate the type of crystal structure at which he should aim to achieve a given end. The remarkable series of alloys having special magnetic properties, the "Mu" alloy, with its very extraordinary high permeability, the cobalt steels, and the more recent cobalt-aluminium steels with magnetic properties so extraordinary that it is difficult to produce electrically magnet fields sufficiently strong to magnetise them to saturation, indicate how very limited appear to be the ratios of the alloying elements to produce almost perfection for certain purposes. The same success has not yet been achieved to meet the pressing needs of the mechanical and structural engineer, but by well-directed research much has already been achieved.

Is the Corrosion of Metals always Electrolytic?

Demarcation between chemical and electrolytic corrosion was not valid, Mr. H. E. Yerbury maintained in a paper which was read in London on October 27th before the JUNIOR INSTITUTION OF ENGINEERS. He submitted that the electrolytic theory covered all the phenomena which took place when a metal was decomposed. Pure iron was remarkably immune: the more impure the metal the greater was its tendency to decompose. It was unfortunate that steel was taking the place of wrought iron; for instance, if such structures as coal bunkers, which could not be painted internally, were made of wrought iron instead of steel their life would be doubled.

The Cost of Electrically Produced Hot Water and Steam

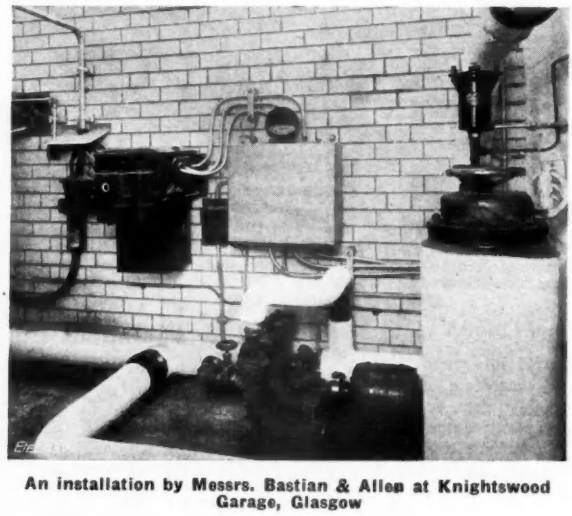
THE cost of providing an ample supply of steam or hot water for various industrial processes is usually over-estimated. A true comparison of electrical with other methods can be ascertained only from the cost incurred over a reasonable period. Messrs. Bastian & Allen, Ltd., have furnished us with figures of results achieved from which we have selected those that appear in the following table:—

Purpose.	Running Costs. kW installed.	Rate per kWh pence.	Annual cost. £
Washing lemonade bottles	120 E.	0.375	348
Small laundry	120 E.	0.5 off-peak	104
Knitting factory (wool process)	25 E.	0.75 to 0.5	41
Steam cooking, heating and hot water in restaurant	350 E. 150 E.	0.5 day 0.375 night	776
Dry cleaning of clothes	70 E.	0.5 off-peak	185
Storage heating, 100-bus garage (945,000 cu ft.)	1,000 C. 60 C.	0.26 night	1,180
Storage heating, factory (203,000 cu. ft.), and offices (44,000 cu. ft.)	200 C.	0.4 night	257
Storage heating, showrooms (500,000 cu. ft.)	2,175 C.	0.3 night	571
Church heating	60 C.	0.75 off-peak	45
Central heating, private house	60 C.	0.5	111

E.—Electrode steam boiler; A.—Air heater; C.—Hot-water circulators.

The bottle-washing plant replaced a coal boiler; allowing for labour saved, the net gain was 15 per cent. per annum or £59. The restaurant referred to is the Gordon Street Restaurant, Glasgow; 3,500 gallons of hot water at 150 deg. F. is required daily to supply forty-two hand basins, sixteen sinks, and dish washers. The steam-cooking equipment comprises five large bain maries, three stock boiler pots, three large serving tables with hot presses, and a four-door vegetable steamer. The church is open all the week. Its content is 101,259 cu. ft. The heating surface is 900 sq. ft., and the total heat loss is 162,000 B.th.u. per hour.

The output from the heating system in the private house (which is in Scotland and is typical of several equipped) is 165,000 B.th.u. The circulation is controlled by air thermostat. The annual running cost is within £1 of the initial estimate.



An installation by Messrs. Bastian & Allen at Knightswood Garage, Glasgow

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

"The Dead Hand"

Your leaderette under the above heading raises a question which calls for immediate action if the activities of the E.D.A. are not to be turned into a farce. On entering a certain town in the Midlands the other day I encountered a glaring example of this muddle-headed municipal publicity. Posted on the electric trolley buses, and visible about a quarter of a mile away, were the words: "The Perfect Fuel for Heating is Gas." Whether a poisonous and foul-smelling product can be regarded as perfect (except in one respect to which the daily newspapers frequently testify) is beside the point. That the Electricity Department should be exploited to boost a competitive product is enough to make any commercially-minded electrical engineer resort to a prolonged draught of the "perfect fuel."

Why wait for Acts of Parliament? A minority of electrical engineers with the courage of their convictions could accomplish a great deal in a fraction of the time. Is it a five-year plan or a fifty-year plan that is being contemplated by our experts? M. W. SINGER.

Edgbaston, Birmingham, *November 4th.*

The left-hand picture shows a giant rotor erected at West Burlington, New Jersey, in connection with an experimental plant for generating electricity by wind power. The generator is seen in the right-hand illustration, which also shows the inventor, Mr. Julius Madaras

Overhead Road Crossings

The following experience in relation to overhead lines may interest other engineers. I am at present erecting three lines and using Pirelli cross-arms. From Pirelli's booklet and my reading of the Electricity Commissioners' Regulations No. 18 (2) (c) it would appear that two insulators in line with an earth bar should satisfy the requirements for road crossings by providing duplicate insulators.

Upon referring the matter to the Electricity Commission I am informed that a bridle should be placed above insulators in tandem so as to project 4 to 6 in. above the main conductor. From an ordinary dictionary interpretation of "duplicate insulators," two insulators in line without a bridle should comply with the regulations, but from the electrical point of view these are not duplicate insulators. F. R. C. ROBERTS.

Engineer and Manager, U.D.C. Electricity Dept.

Spalding, *November 2nd.*

Test Reports and Sales Propaganda

Records of good performance have always formed a recognised basis of sales publicity, and when such records are testified by independent testing laboratories they are particularly impressive; hence the growing use of official test certificates for national advertising and private salesmanship. The procedure is well known: the testing authority takes away random specimens from the makers' premises, and subject to a favourable report being awarded, publication follows through the Press or by circular, due permission being readily obtained. Since the test certificate deals only with the particular batch offered for examination, the satisfaction of the same high standard at all other times and occasions is not thereby demonstrated, but the intrinsic value of the test rests in the indication definitely provided of the possession by the maker of the knowledge and resources adequate for the production of articles of merit, and most interests would agree that the use by the maker of such positive evidence of his ability constitutes useful and valid publicity.

Now it is also possible for the maker (or his agent) to submit parcels of *competing* brands for examination in which case the report will be used only if it is *unfavourable*, for it appears that the testing laboratory sanctions the publication of all verbatim certificates even without the consent of the maker of the affected articles, and notwithstanding the fact that test reports are not concerned with the previous history of the articles examined. As a result, the names of famous institutions can be dragged into the service of technical mudslinging which cannot enhance the prestige of the electrical industry, and out of which (if unchecked) even great reputations may not emerge untarnished.

It is felt that salesmanship by disparagement in the above, and every other, form is unwholesome and should be discouraged, and in this connection some qualification of the legitimate use of test certificates may be in the interests of all sections and members of our industry.

London, E.C.1, *Nov. 6th.* TUNGSTALITE, LTD.

Inadequate Mains: Indifferent Employés

I have followed with great interest, as have also a number of my friends, the discussion which arose from the article "Inadequate Mains and Indifferent Employés." Personally, I am unable to see any solution until some aspects of human nature are changed. When this comes to pass, if ever, we shall have the solutions to the disarmament, gold-standard, war-debts, social-economic and religious problems which have amassed themselves in formidable array under the careful encouragement of modern civilisation.

The same problems which have been described by your disputants occur in the Dominions, only we have an added factor. The young Dominion engineer very often has to "carry" technically the man from an older country who secures an executive position on the strength of having worked with some well-known firm. No doubt he has, but that, of course, never serves as a true criterion of what he "knows."

Another serious mistake often made is to label a "rule of thumb" man a "practical" man. Some "rule of thumb" men can go on for years provided there is no competition, but they are not "practical" men, as I understand the term, until they know the reasons and the justification for what they do in imitation of some one else. Then they have to assimilate some of the much-despised "theory," and it takes a lot of digesting. Lack of knowledge of the more essential technical processes is excused sometimes by the possession of so-called "business knowledge." Unfortunately this too often consists of a questionable ability to bully oneself out of contracts and agreements.

This has been much to the fore during the depression when men under £450 have made sacrifices of the order of 25 per

cent., while others above have achieved 2 and even 3 per cent. with all privileges and perquisites untouched. The same work, in some cases even more work, has been done, especially by the lower-paid men, while their more fortunate brethren have snaffled the credit and the cash. AUSTRALIAN.

New South Wales, *October 3rd.*

Current Transformers

Before commenting upon Mr. G. A. Robertson's interesting contribution to the discussion on this subject it might be well to point out that the subject is not merely of academic interest, for, in applying the method of symmetrical components to the analysis of networks for the correct application of circuit-breaker relay protective devices, it is essential to recognise those circuits wherein zero-sequence components can or cannot flow, otherwise serious mistakes can be made in computing the distribution of fault currents.

Moreover, it is important to remember that the component systems behave as though a simultaneous fault exists in the three phases, yet combine in such a manner that the total currents in the lines satisfy the actual conditions of the fault. Now Mr. Robertson suggests that, owing to the peculiar construction of the magnetic circuit of a three-phase core-type transformer, the paths for the flux generated by zero-sequence component currents are of high reluctance, *i.e.*, partially through air. But Mr. Robertson does not envisage complete suppression of the flux; hence it must be compensated for and by zero-sequence components, not by positive and negative sequence components because the latter, being balanced three-phase systems, have normal paths for their flux, *i.e.*, through the iron. There is, however, no path for these compensating zero-sequence components, and, unless the primary neutral be earthed or the transformer provided with a closed tertiary winding, they cannot flow.

The analogy, sought to be drawn between the path presented to the flow of zero-sequence flux and a tertiary winding, is inadmissible. My contention is that, in this case, the zero-sequence components cannot exist; that the total current in the faulty line is composed of positive and negative sequence components only, these being in phase with one another.

London, N.3, *November 6th.* THOMAS ELLIS.

"Cheap Lamps"

Why all this controversy about cheap lamps? A few weeks ago I walked into the office of one of the largest industrial concerns in the kingdom and found what appeared to be a 100-W frosted lamp with a piece of cardboard twisted around it to form a reflector. How many thousands of lamps do we find to-day in factories without reflectors at all, or with some form of inadequate and dirty so-called reflector? There is no such thing as a "cheap lamp" in such circumstances. Obviously what is required is cheap and adequate lighting. This cannot be effected without making use of suitable equipment. It is for the works engineer to emphasise this matter to his employer. If his advice be followed then both the trade and the consumer would undoubtedly benefit.

In the light of this statement, talk of cheap lamps is nothing short of useless "clap trap." We are not getting down to the needs of the industrial consumer. The "nigger in the wood pile" is that in so many cases thousands of lamps are ordered and thousands of units continually paid for, and wasted, for want of investigation and forthought.

G. T. CHAMPION, A.M.I.Mech.E., A.I.E.E.

Bristol, *November 6th.*

Electromagnetic Couplings. By J. F. Romer

THE ordinary friction clutch is satisfactory when fully engaged, but if slipping occurs the friction surfaces deteriorate, and it is not easy with large powers to design a clutch that will engage without a jerk. For many purposes smooth starting and continuous slipping are essential. This has resulted in the resuscitation and development of the hydraulic coupling which enables a gradual start to be obtained with slipping for any length of time, but it cannot be disengaged and may creep on light loads.

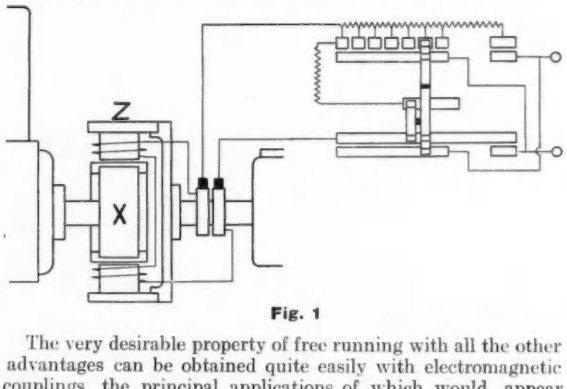


Fig. 1

The very desirable property of free running with all the other advantages can be obtained quite easily with electromagnetic couplings, the principal applications of which would appear to be to automobiles and Diesel locomotives. The difficulty of changing gear with a friction clutch and of obtaining free running with the hydraulic coupling has brought about the use of full electric transmission in many cases where a gear box combined with an electromagnetic coupling would have been cheaper and more satisfactory. Fig. 1 shows an engine and gear box connected by one form of such coupling; the revolving member X, driven by the engine, is an ordinary squirrel-cage rotor; it is surrounded by an ordinary d.c. multipolar field-magnet system Z, which is connected to the gear box. Exciting current is supplied from an external source and is conducted to the field-magnet windings by the two slip-rings shown. On full excitation this coupling will behave like an ordinary induction motor, the power transmitted being proportional to the slip, which can be adjusted by varying the field current. With no exciting current the residual magnetism of the field system might cause the coupling to creep on light loads; to overcome this the controlling resistance is so arranged that a reverse current can be supplied which is just sufficient to neutralise the residual magnetism. The controller shown in the diagram is of the field break type. Moving the sliding arm from left to right puts resistance in the field circuit, and then connects the discharge resistance; further movement breaks circuit and then connects the field magnets in the reverse direction through the regulating resistance.

The most successful electric transmissions of the ordinary type make use of a separate generator for obtaining exciting current, and in this case a small shunt dynamo could be mounted on the driving shaft. As the frequency of magnetic reversal at full speed is very low, the driven half of the coupling can be made very light by employing a large number of poles. With an engine running at 1,200 r.p.m., for example, a twenty-pole magnet system, at 5 per cent. slip, would produce a rotor current having a frequency of only ten cycles per second. With such a low frequency, very high flux densities can be used, and the weight of iron reduced to a minimum without excessive losses, while air cooling presents no difficulties. Unlike the hydraulic coupling, which is of necessity hermetically sealed, this coupling can be left open for the air to circulate freely through it. To keep the slip-ring friction losses as low as possible the field magnets are made the lower speed or driven member.

Fig. 2 illustrates a slightly different form of coupling. This is really a multipolar separately excited d.c. generator with field magnets as well as armature arranged to revolve. The commutator brushes revolve with the field-magnet system and are short circuited by a low-resistance connector. As the commutator diameter is much greater than that of the slip rings, the armature is made the lower speed member. The exciting current is supplied from an external source; it could be taken from the armature, but this would necessitate a much higher armature voltage, and would not only cause increased slip and lower efficiency, but would make the coupling very much larger for a given power.

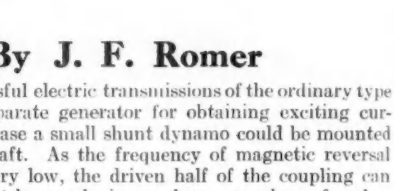


Fig. 2

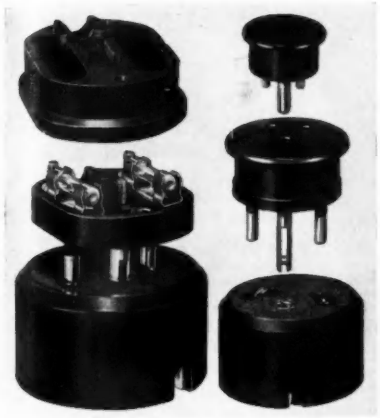
This coupling has the advantage over that shown in fig. 1 of giving a much stronger starting torque and consequently allowing very much more rapid acceleration, the characteristics being similar to those of a compound motor. As the full-speed slip is so low no interpoles or other commutating devices are necessary. Possible creeping through residual magnetism is avoided in the same way as in fig. 1. This coupling was tried in a slightly different form on the well-known Entz transmission system and worked well. The chief difficulty, for large powers, is designing satisfactory revolving brush gear; and for a locomotive the type shown in fig. 1 would be preferable. In such applications as the driving of rotary printing presses and textile machines, electromagnetic couplings also offer great advantages over the ordinary friction clutch.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Earth-pin Operated Switch-plugs

The "Wandsworth" switch-plug was dealt with on page 431 of our issue of September 23rd, 1932, where we described how the insertion and withdrawal of the earth pin automatically switched the supply on and off. The WANDSWORTH ELECTRICAL MFG. CO., LTD., Kenyon Street, Birmingham, 18, now informs us that a 15-A model has been added, and that a fused adaptor into which fits a special 5-A plug, is available for use with this model. A further addition is a fused plug top for the 10-A model.



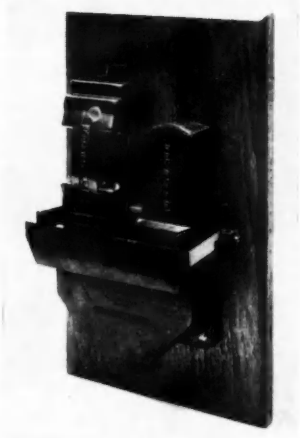
The "Wandsworth" fused switch-plug and 5-A adaptor for 15-A switchplug

The accompanying illustration shows clearly the assembly of the fused adaptor and 5-A plug when used in conjunction with the 15-A interlocked switch-plug socket, thereby giving a directly connected 15-A circuit and a 5-A fused subsidiary circuit. The price is 6s. per set. The fused switch-plug top for use with the 10-A model, in common with all the other components, is constructed of bakelite, and a cartridge fuse is incorporated in each pole. As standard it is fitted with a 5-A fuse, although ½- or 10-A fuses can be substituted without any increase in the cost, which is 3s. 9d.

A House-service Fuse-box

An all-insulated house-service fuse-box has recently been introduced by MESSRS. A. REYROLLE & CO., LTD., Hebburn-on-Tyne. The unit consists of three distinct parts: a cable sealing box, a self-aligning fuse, and a separately enclosed neutral link, and all the insulating and enclosing parts are made of moulded insulation.

The cable-box, which is suitable for compound-filling, is accessible on the removal of a cover fitting over the top and part of the front; the fuse-handle is withdrawable in the usual way, and the cover over the neutral link can be slid upwards. When the parts are assembled, the cable-box cover locks the fuse-handle in such a way as to prevent its removal unless the cover is first removed; and, since this cover and the neutral link cover can be sealed, unauthorised tampering with the interior is effectively prevented. The cable-box has three holes for incoming cables. One of these is bushed, and the other two are closed by a thin layer of moulded insulation, which is easily pierced and removed if the holes are to be used for taking out loop-connections. The rating is 30 A at 250 V.



The Reyrolle house-service fuse-box

Wire-wound Resistances

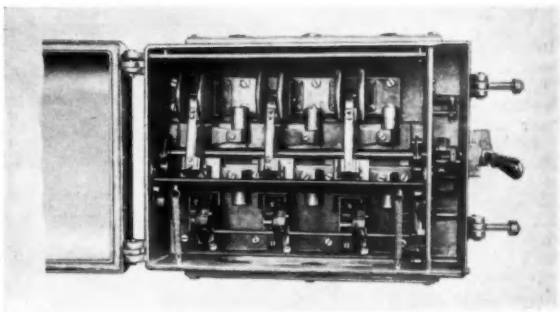
We have examined a new type of resistance which is being made by the WATMEL WIRELESS CO., LTD., Imperial Works, High Street, Edgware. Known as the "Hy-Watt," the resistance has been wound with a special iron-free resistance wire on ceramic porcelain so that it will stand a considerable amount of overloading, and also be mechanically strong and unaffected by temperature changes. An important feature is that the element is spot-welded to the lead wires, and the whole resistance protected by a coating of "Vita" heat-resisting enamel. During tests a "Hy-Watt" 10,000-ohm resistance maintained its rated value up to 38 mA (14 W), although only rated at 3 W; during another test it ran at 450 V, loaded at 20 W for two hours without breakdown.

All models are guaranteed to within plus or minus five per cent. of the rated value, and one per cent. can be guaranteed at a slight extra cost. The price is 1s., the size 1¾ in. by $\frac{5}{16}$ in., and values from 1 to 50,000 ohms are obtainable.

Line Contact Circuit-breakers

Air-break circuit-breakers have been the subject of a great deal of research during recent years. Hitherto, the standard design has involved the use of laminated brushes, but the new line contact circuit-breakers now being manufactured by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, embody a new principle which avoids this.

The construction is such that it allows a much larger section of metal and a higher pressure than that of the normal brush type; it takes the form of "V" shaped copper blades which fit into similarly shaped grooves in the contact block. The actual number of blades used for any particular breaker is determined by the current it is designed to carry, as each blade carries approximately 125 A. Contact resistance has been reduced to a very low level without making the breaker difficult to operate. Experiments have shown that the voltage drop from block to block, when each blade is carrying 125 A, is a maximum total of 8 mV, of which 2 mV is in the blade and 3 mV at each end. These results are partly due to a device which causes the blades to slide upwards in their grooves after contact has first been made. This sliding action is effected by an arrangement of the thrust bar, which during the last few degrees of movement still retains the vertical component, and its effect, combined with the wedging action, is to force the contact faces into intimate contact and to penetrate any dirt which may have formed.



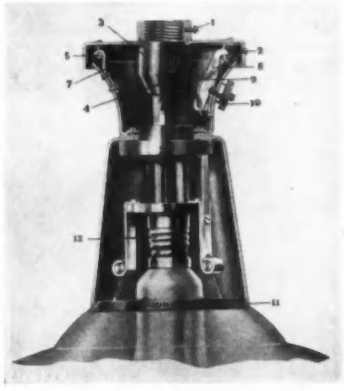
The G.E.C. line contact circuit-breaker

These line-contact circuit-breakers are made in sizes up to 600 A, in single-, double-, and triple-pole forms, with or without neutral link.

A New Reflector

A new reflector has been introduced by MESSRS. BENJAMIN ELECTRIC LTD., Brantwood Works, Tariff Road, Tottenham, N.17. With this system, known as the "Saaflux," one of the advantages is the easy detachability of the lamp and reflector complete as one unit, without disturbing the former from its holder. It is therefore possible to clean thoroughly both the lamp and reflector in a convenient position at ground level, whilst if a spare reflector and lamp are used, it is possible to detach the dirty reflector and replace it with a clean one with one journey up the ladder, provided that the latter is equipped previously with two cradles at the top to hold the reflectors whilst they are being changed over.

Gasfilled lamps have steadily increased in efficiency and this improvement has brought with it a corresponding increase in filament temperatures. In latter years this high temperature has, in certain cases, given rise to trouble due to the insulation of the cables perishing and causing short circuits, etc. As a result of lengthy investigation by the British Electrical and Allied Industries Research Association, a paper on this subject was read before the Institution of Electrical Engineers earlier this year (ELECTRICAL REVIEW, April 21st and 28th, 1933). The maximum operating temperatures for v.i.r. cables according to the I.E.E. regulations is 48.8 deg. C. An N.P.L. Certificate shows that with



The Benjamin "Saaflux" reflector

the "Saaflux" system the temperature of the cables is reduced to within safe limits.

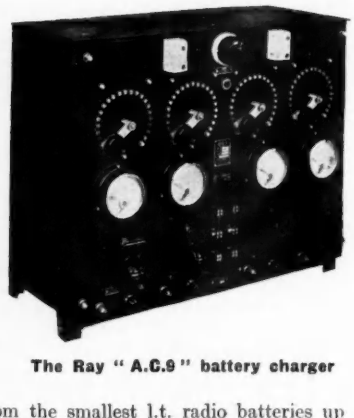
A further advantage is the provision of 5 per cent. more light due to the introduction of a supplementary reflector (11), which in addition acts as a heat baffle and lampholder skirt.

Cables of differing polarity are kept apart in a terminal block (4); the latter is marked "L" and "N" in accordance with the British Standard nomenclature indicating the polarity to be maintained in wiring, which, by the non-reversible construction of the "Saaflux," ensures the negative or neutral wire being connected to the shell of the lampholder (12); the reflector is earthed right through from the fixing flange to the supplementary reflector; and an earthing terminal is provided on the flange for independent earth connection (2).

The flange is locked by the grub screw (1), and there is a locking nut (10) to maintain the reflector in position. For further protection there is a strong flat spring (9) to keep the catch (8) in position. There is a strong flat hook (7) which goes over a stirrup (5) in the flange.

Ray Rectifiers

Two new four-circuit models have been added to the range of battery-charging rectifiers manufactured by the RAY ENGINEERING CO., LTD., Waterdale Works, Southmead, Bristol. The type "A.C.17" is a combined l.t. and h.t. charger. The l.t. output is 40 V, 6 A, d.c. on two circuits, with a choice of 25 V by means of a change-over switch, and the h.t. output is 160 V, 1.3 A, d.c. on two circuits, with a choice of 85 V by means of a change-over switch, enabling h.t. batteries to be charged in series in either 120-V or 60-V blocks. Both l.t. and h.t. circuits are protected against overload by automatic circuit-breakers, and the trade price is £21.



The Ray "A.C.9" battery charger

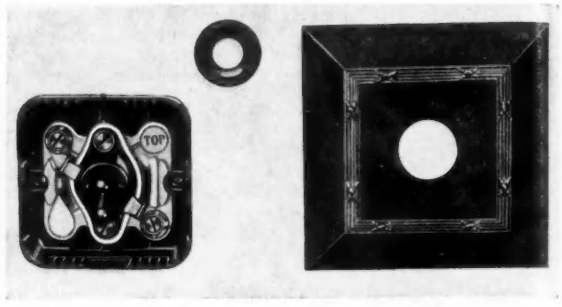
The type "A.C.9" is particularly useful where comprehensive charging is being carried on, as it is capable of charging from the smallest l.t. radio batteries up to full-capacity starter batteries. It is fitted with four circuits which may be used either independently or simultaneously, the four circuits giving charging rates of 0.2/1, 1/2, 2/4, and 5/8 A respectively, each circuit being fitted with a current regulator, ammeter and overload protection circuit breaker. The maximum output of this model is 85 V, 15 A, d.c., and for purposes of economy a change-over switch is fitted giving an alternative of 50 V. The price is £37 (trade).

For those who require an inexpensive h.t. charger there is the type "A.C.7," which was introduced earlier in the year, and has two circuits with a maximum output of 160 V, 1.3 A, d.c., enabling 10-120-V batteries to be charged at 0.2 A at one time. This type is priced at £11 5s. (trade).

A Recessed or Surface Switch

The new "Tenbyluxe" switch has a number of special features. The switch and box have been designed as standard for either surface or recessed mounting. When used on the surface of a wall a specially shaped moulded plate, which fits right over it, is used, giving the appearance of a semi-sunk switch, since the projection is only ¾ in. The switch itself has a porcelain base, and the two-way models have a shrouded bonding strip.

Liberally designed arc channels are provided, and the bearing washer is of hard grey fibre. The bridge is of bakelite, with a clean-cut metal thread. The "Tenby" turret-type terminal is used throughout, a washer being fixed to the screw-head to clamp the wires when the screw is driven home. The two-piece contacts are of phosphor bronze, and the turned "Erinoid" dolly, metallically reinforced, operates a q.m. and b. movement with a specially tempered rustless-steel spring.

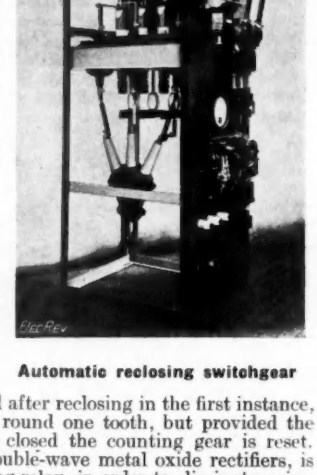


The new "Tenbyluxe" switch

The bakelite box has knock-out entries on all sides, together with four back-entry knock-outs designed to take either twin flat or round cable. Prices per dozen are as follows: One-way, 5-A switch, with ring only, 15s.; with ring and sunk-type plate, 18s.; or surface-type plate, 19s.; two-way models are 6s. extra in all cases. The manufacturers are MESSRS. S. O. BOWKER, LTD., Tenby Works, Regent Row, Birmingham.

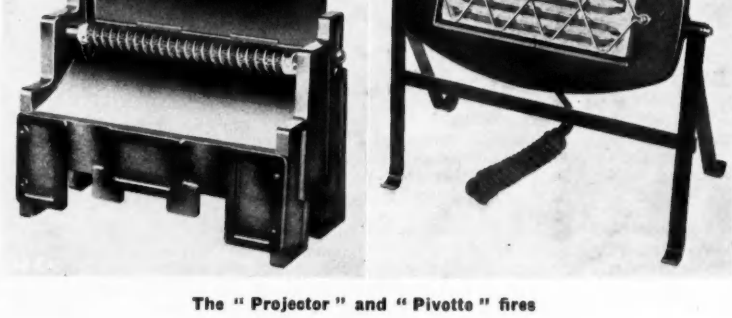
Automatic Reclosing Equipment

The ENGLISH ELECTRIC CO., LTD., Stafford, has developed an automatic reclosing equipment. That illustrated is for use on 11-kV 3-phase 50-cycle systems, but it can be supplied to meet any requirement. The equipment consists of a motor-operated oil circuit-breaker with automatic relays. After the breaker has opened on a feeder fault it is automatically reclosed after a predetermined time interval. If the fault persists and the breaker again opens, it is reclosed at regular intervals for a definite number of times. Should the fault not have cleared itself after the full number of reclosures the breaker will remain open until closed by a hand arrangement, an alarm circuit indicating that the feeder is locked out. The number of reclosures can be adjusted between one and nine, and the interval between reclosing may be set for a few seconds up to three minutes. Should the circuit-breaker, after being reclosed, remain closed for a longer period than the maximum setting of the overload time lags, the counting mechanism is automatically reset to give again the predetermined number of reclosures.



Automatic reclosing switchgear

When the reclose contactor has been de-energised after reclosing in the first instance, the mechanism is notched round one tooth, but provided the oil circuit-breaker remains closed the counting gear is reset. D.c., obtained from two double-wave metal oxide rectifiers, is used to energise the resetting relay, in order to eliminate noise, since the coil is continuously in circuit. The resetting relay has a longer time-lag than have the over-load relays, in order to prevent the counting mechanism from being reset before the over-load relays have had time to trip the oil circuit-breaker, should it be closed on overload.



The "Projector" and "Pivotte" fires

Inexpensive Fires

The new fires introduced by MESSRS. BERKELEY & YOUNG, LTD., Tyseley, Birmingham, for the 1933-34 season are the "Pivotte," "Pedestal," and "Projector." In the first two of these new models the fires themselves are designed on similar lines but have different types of stands. Both are priced at 10s. 6d. with a coloured finish, although the "Pivotte" can be obtained at 8s. 6d. in stove black. The "Projector" is of robust and pleasing appearance and its design is somewhat unusual. The horizontal bar element, loaded at 1¼ kW, is fixed in front of a curved burnished copper reflector, and the frame is finished in sprayed oxidised copper. The list price is one guinea.

The Hick, Hargreaves Centenary

Congratulations from prominent engineers and industrialists

A DINNER was given by Messrs. Hick, Hargreaves & Co. at the Midland Hotel, Manchester, on November 2nd to commemorate their centenary. Many prominent figures in the industrial and engineering world were among the guests, including Messrs. V. Z. de Ferranti, H. C. Lamb, G. G. L. Preece, chairman of the North Western Centre of the I.E.E., C. D. Taite, D. A. Bremner, director, British Engineers' Association, and F. O. L. Chorlton, chairman of the Bolton Engineering Employers' Association. An attractive brochure entitled "A Hundred Years of Engineering Progress," was prepared for the occasion, giving a brief outline of the company's history.

The chairman was Mr. W. D'Arcy Madden, managing director of the company. After the loyal toast, the health of "Hick, Hargreaves & Co., Ltd.," was proposed by Mr. W. B. Woodhouse, who said that when Mr. Benjamin Hick started the business a hundred years ago, describing himself as an engineer, millwright and ironfounder, engineering was just beginning to make a name for itself. The firm from its earliest days was a firm with character, and its reputation was built up on its appreciation of "something well made through and through," which he considered was the fundamental spirit of good engineering. Especially during the period of Mr. William Hargreaves (1843-89) daily developments were taking place in engineering, and to remain in existence throughout that period a firm had to be extraordinarily alive and efficient.

[*Elliott & Fry*

Mr. W. D'Arcy Madden, managing director, Hick, Hargreaves & Co., Ltd.

In the very early days the firm became prominent as makers of locomotives. Their fame as makers of cotton mill engines spread to other industries, and they were also responsible for the prime-movers for many of the cotton mills which sprang up in other countries. He went on to tell how in conjunction with the late Dr. Ferranti the firm had supplied the engines for the Deptford power station in 1888 and had since been associated with plant for many famous power stations. He referred to the fine record the firm had in the war, and more recently to their development of steam turbines, turbo compressors, &c. The secret of their success, he said, had been their great vision and ability to look ahead.

Carrying on the Traditions

Responding, the chairman warmly thanked Mr. Woodhouse for the tribute which he had paid to the firm. He apologised for the unavoidable absence of Mr. Robson, chairman of the company, who was very disappointed at being unable to be present. They had had innumerable messages of congratulation from friends and rivals in the trade. This was a very proud night for all connected with the firm. Their predecessors had built up a wonderful reputation, but the responsibility was on themselves of carrying on the fine tradition. In a résumé of many of the developments of the company Mr. Madden mentioned the important work the firm had done in connection with the national grid scheme. They were very proud of the fact that the largest condensers in the world had been built in their works, for the great power station at Barking.

He did not subscribe to the view that the whole future lay with big combines, and held that the engineering trade would be greatly the poorer if it lost individuality. The individual firms would continue to play an important part in the trade, though greater co-operation would be necessary, and there would have to be an end of much of the existing wasteful competition. There was a general belief that the darkness of depression was beginning to fade, and that the rays of the sunrise of better times were becoming dimly visible. There was, he thought, some justification for returning confidence, and when their great industries revived, as they were now beginning to do, they would find the company ready to give in the future that service which they had continually given in the past century.

Proposing "Our Guests," Mr. Harman Hargreaves was able to make many pleasing personal references to those present, and was given very warm applause when he resumed his seat. This toast was responded to by Alderman Lomax, Mayor of Bolton, and Mr. John Taylor, of Messrs. Mather & Platt. Mr. Taylor said that as a Bolton man he had been familiar with the Soho Works and many of its personalities since his childhood. He hoped that the firm would live to celebrate its 200th birthday.

Swedish Electrical Exports and Imports

BELOW are reproduced statistics of the principal classes of Sweden's electrical exports and imports last year, together with the more noteworthy countries of destination or origin, and a note of the increase or decrease compared with 1931. The figures are taken from the Swedish official foreign trade returns which, however, omit countries of destination in respect of vacuum cleaners which represent one of the principal items in the export list. (£1=8 kr.)

EXPORTS

	1932. Kr. (thous.)	Inc. or Dec. Kr. (thous.)
Motors and generators—		
Total	7,914	− 1,026
To Great Britain	460	− 1,320
„ China	254	+ 129
„ Soviet Russia	980	+ 890
Transformers—		
Total	2,467	+ 142
To Belgium	460	− 80
„ Finland	400	+ 310
Starting and regulating resistances—		
Total	675	+ 210
To Soviet Russia	135	+ 125
„ Holland	137	+ 132
„ S. Africa	105	+ 85
Stators, rotors, current collectors, etc.—		
Total	2,110	− 890
To Great Britain	455	− 5
„ France	465	− 375
Switchgear—		
Total	520	− 460
To Great Britain	35	− 265
„ Finland	135	+ 105
„ Soviet Russia	130	+ 110
Telegraph and telephone apparatus—		
Total	7,140	− 7,820
To Norway	420	+ 270
„ Finland	310	− 50
„ Poland	3,050	+ 260
„ Holland	600	− 860
„ Italy	1,140	− 1,350
„ S. Africa	310	− 70
Insulated wires and cables—		
Total	1,910	− 1,390
To Poland	280	+ 60
„ Mexico	210	− 610
„ S. Africa	130	+ 50
Metal filament lamps—		
Total	720	+ 190
To Norway	304	+ 4
„ Denmark	194	+ 29
„ Finland	56	+ 16
Carbons for elec. purposes—		
Total	230	− 40
To Norway	95	+ 60
Radio apparatus—		
Total	990	− 1,670
To Norway	240	− 140
„ Finland	220	+ 10
„ Greece	220	− 870
Batteries and accumulators—		
Total	1,670	− 1,570
To Great Britain	28	+ 15
„ Soviet Russia	295	− 1,675
Vacuum cleaners—		
Total	4,195	− 3,905

IMPORTS

	1932. Kr. (thous.)	Inc. or Dec. Kr. (thous.)
Batteries, accumulators and parts—		
Total	3,720	− 1,260
From Great Britain	385	+ 125
„ Germany	1,960	− 850
Radio apparatus—		
Total	7,570	− 5,330
From Great Britain	460	− 290
„ Germany	3,900	− 3,970
„ Holland	2,270	− 1,210
Motors and generators—		
Total	2,400	− 770
From Great Britain	90	− 60
„ Germany	1,820	− 195
Stators, rotors, current collectors, etc.—		
Total	360	− 60
Metal filament lamps—		
Total	1,130	− 640
From Germany	420	− 290
„ Holland	450	− 90
Carbon for elec. purposes—		
Total	1,820	+ 505
From Great Britain (*brushes*)	130	—
Switches, etc.—		
Total	2,270	− 500
From Germany	1,960	− 290
Regulating and control apparatus—		
Total	340	− 90
Electricity meters—		
Total	1,150	− 220
From Germany	1,060	− 30
Other elec. measuring instruments—		
Total	650	− 70
From Germany	500	− 70
Insulated cables and wires—		
Total	1,950	− 1,890
From Germany	1,700	− 1,680
Röntgen-ray apparatus—		
Total	300	− 70
From Germany	264	− 82
Vacuum cleaners—		
Total	275	− 235
From Germany	250	− 220
Insulating tubes—		
Total (Germany)	230	− 140

The Indian Electrical Market

SIR THOMAS M. AINSCOUGH, H.M. Senior Trade Commissioner in India and Ceylon, gives some useful notes on the present position regarding the Indian electrical market in a recent Department of Overseas Trade report on United Kingdom trade with India during 1932-33 (Stationery Office, 3s. 6d.).

The year under review, he says, probably witnessed the nadir of India's economic history for many years to come. The country's trade and economic life was at the mercy of the world-wide forces which have sent commodity prices to still lower depths, have restricted international exchange of goods to barest necessities, and have reduced the purchasing power of the people until they have been forced to make heavy drafts upon their reserves of the precious metals. The almost complete cessation of the boycott of United Kingdom goods and the ratification of the Ottawa Trade Agreement, however, resulted in increased imports from the United Kingdom.

Study of the table below will give an idea of the state of the electrical import market during the past two years:—

	1931–32. Rs. (lakhs)	1932–33. Rs. (lakhs)
Control gear and switchgear	35	27
Generators, alternators and dynamos	46	19
Motors	30	24
Transformers	11	19
Turbo-generating sets	4	5
Other electrical machinery	90	62
Electric fans and parts	19	22
Electric wires and cables	60	59
Telegraph and teelphone instruments	5	5
Electric lamps and parts	54	55
Batteries	11	13
Electric carbons	3	3
Accumulators	9	9
Electric lighting accessories and fittings, including switches	8	8
Meters	7	10
Electro-medical apparatus, including X-ray equipment	3	3
Switchboards (other than telegraph and telephone)	3	2
Unenumerated electrical apparatus	41	45
Total	4,39	3,90

The completion of deliveries of heavy plant for the hydro-electric projects in the Punjab, Madras and elsewhere, combined with the effects of the financial stringency, which is precluding both the Central and Provincial Governments from embarking upon new capital undertakings, have resulted in a sharp reduction of the electrical machinery imports. The smaller power companies have also suffered from the effects of trade depression but recently have seemed to show more confidence in the future and a disposition to prepare for expansion when the trade revival sets in. There is such a scope for the further extension of electrical power schemes throughout India and the application of power to agricultural and minor industries that the future may be regarded with confidence. A revival in the demand for plant is contingent upon the restoration of India's agricultural position and the revival of her industries.

Trade with the U.K. Increasing

Thanks to their excellent local sales, technical and service organisation, it will be seen from the figures below that United Kingdom manufacturers have managed to improve their share of the reduced trade in the electrical machinery market from 69 to 77 per cent.

Country of Origin.	1931–32. Rs. (lakhs)	1932–33. Rs. (lakhs)
United Kingdom	1,50	1,21
Germany	15	10
U.S.A.	36	16
Other Countries	15	9
Total	2,16	1,56

In view of the keen competition for the reduced volume of work, the business has been largely unremunerative and there has been a natural tendency to scale down overhead charges by reducing staffs and facilities. Sir Thomas warns producers not to carry this process too far as he says that there are distinct signs that the worst of the depression is past and British firms should be ready to take advantage of the revival of trade when it comes.

The Electrical Apparatus Trade

Analysing the statistics relating to electrical apparatus imports we find that the United Kingdom's share in the trade in electric fans increased from Rs.10½ lakhs in 1931-32 to Rs.13 lakhs in 1932-33, and that of Italy from Rs.4 lakhs to Rs.4½ lakhs. Purchases of British electric wires and cables fell from Rs.43¾ lakhs to Rs.41 lakhs and the United Kingdom supplied Rs.4 lakhs worth of the telegraph and telephone apparatus.

The value of shipments of United Kingdom gasfilled lamps rose from Rs.7 lakhs to Rs.8 lakhs, while purchases from Holland fell from Rs.4¾ lakhs to Rs.3½ lakhs. Imports of British vacuum lamps remained steady at Rs.5½ lakhs; Japan's share increased from Rs.2 lakhs to Rs.3½ lakhs.

Imports of batteries and accumulators from the United Kingdom rose respectively from Rs.2 lakhs to Rs.3½ lakhs, and from Rs.8½ lakhs to Rs.9 lakhs. The trade in electric lighting accessories and fittings (including switches) was contributed to by Germany Rs.3¾ lakhs, the U.K. Rs.2¾ lakhs, and "other countries" Rs.1¾ lakhs. The United Kingdom's share in the meter trade rose from Rs.3½ lakhs to Rs.5½ lakhs, while practically the whole of the Rs.2 lakhs worth of switchboards arrived from the U.K. Of the unenumerated apparatus the U.K.'s share remained steady at Rs.21½ lakhs, that of Germany rose from Rs.5½ lakhs to Rs.7½ lakhs, while that of the U.S.A. fell from Rs.10 lakhs to Rs.8½ lakhs.

Sources of Imports

It is satisfactory to note in the table below showing the origin of the total electrical apparatus imports that the United Kingdom's share rose slightly from 51 to 52 per cent. By the Ottawa Trade Agreement a British preferential duty of 10 per cent. is granted to most of the items included under the heading "electrical apparatus."

Country of Origin.	1931–32. Rs. (lakhs)	1932–33. Rs. (lakhs)
United Kingdom	1,15	1,22
Germany	33	34
Netherlands	13	11
Belgium	5	3
Italy	5	6
Japan	5	17
United States	30	26
Other Countries	17	15
Total	2,23	2,34

Imports of radio apparatus have risen from Rs.9 lakhs to Rs.10 lakhs during the past year, mainly on account of plant extensions at the large transmitting and receiving stations operated by the Indian Radio and Cable Communications Co., Ltd. The Government of India State Broadcasting Service continues to operate and should be given a fresh lease of life by the inauguration last December of the Empire broadcasting service from Great Britain. Atmospherics, however, seriously interfere with the service in many places and have so far prevented any very extensive development in the sale of short-wave receiving sets.

New Books

Analytic and Vector Mechanics. By H. W. EDWARDS. Pp. 428; figs. 160. London: McGraw Hill. Price: 24s.

There is a decided gap in the literature of applied mathematics between the elementary school text book and the advanced treatise in which the subject is treated on purely academic lines. Dr. Edwards's book bridges this gap very completely, and its study can be commenced by the student who is acquainted with the rudiments of the calculus. The standard of pure mathematical knowledge required certainly increases as the end of the work is approached, but this is in every way desirable, as the study of pure mathematics is most effective when the applications of the science to problems of mechanics and physics are studied at the same time.

The first part of the book deals with kinematics, statics, and the dynamics of rotation, central forces, and motion in a fluid. The author has established his claim to teach the student to regard mathematical expressions as representations of physical relations, and he has rightly laid stress on the matter of physical dimensions, and the necessity for understanding the dimensional homogeneity of an equation expressing a physical relation. The explanations are full and lucid and will be of great assistance to the student of this difficult branch of mathematics.

The latter part of the work deals with vector fields and with the general motion of a rigid body, and discusses in detail several problems illustrating fundamental principles. The pure mathematics of this section advances to the stage of elementary partial differential equations. There are numerous problems for solution by the student but no answers are given. This limits the appeal of the book to the isolated student, and for such a reader not only should answers to the problems be given but some hints furnished for the solution of those of special difficulty.

Der Selektivschutz nach dem Widerstandsprinzip. By DR. ING. M. WALTER. Pp. 172; figs. 144. Munich and Berlin: R. Oldenbourg. Price: Rm. 8.50.

This book is one of a type which is always welcome, a specialised monograph on a subject of considerable intricacy and great practical importance. The selective protection of electrical networks on the resistance principle is practically essential to the successful operation of modern high-voltage systems, and it is hardly too much to say that the development of various types of relays for this purpose constitutes a new phase of electrical practice. The outstanding merit of

this book is that it presents a clear, comprehensive, and coherent treatment of the whole subject.

Commencing with the basic principles of operation of distance relays, their applicability and general advantages, the author next deals with the construction and action of relay-release devices, and the choice between the various types; the construction and action of operating elements, and the choice between impedance, reactance and resistance as the determining factor; also, the construction and action of directional devices.

The remainder of the book is devoted to a quantitative treatment of problems arising in the application of distance relays. These include the determination of the secondary resistances of current loops in three-phase networks with various types of faults; the choice of time characteristics, the determination of grading intervals, and the factors limiting the total period required for opening the circuit. The work is excellently produced, well indexed and of very reasonable price.

Office Administration for Manufacturers. By R. A. Mills. Pp. xii+408; figs. and tables. London: Sir Isaac Pitman & Sons, Ltd. Price 10s. 6d.

Business managers and others will find much of interest and value to them in this practical work dealing with up-to-date methods of organising manufacturing companies. The author has had experience on the administrative side of several manufacturing concerns both large and small, and in this book he endeavours to define the principles underlying successful organisation and how best they can be adopted. Each of the functions of the company from the opening of the morning's post to advertising, collecting statistics, and market analysis are dealt with in detail, accompanied by lucid examples.

* * *

Shorter Notices

"Fifty Tested Wireless Circuits," by F. J. Camm. Pp. 144; figs. 99. London: George Newnes. Price 2s. 6d. This volume is an expanded edition of an earlier and smaller book, "Twenty-five Tested Wireless Circuits," specially revised and enlarged to embrace recent circuit developments, including quiescent push-pull, "Class B" amplification, double-diode triode and band-pass tuning. There is a special section devoted to adaptors, and four pages are taken up by a description of a simple home-made televisor.

Punch's Almanack for 1934 is now on sale (price 1s.); Mr. Punch is in his usual sparkling form.

"Electricity," by John Pilley. London: Oxford University Press. Price: 7s. 6d.

"Fluorescence Analysis in Ultra-Violet Light," by J. A. Radley and Julius Grant. London: Chapman & Hall. Price: 15s.

In the Courts

IN the House of Lords last week Lords Atkin, Warrington of Clyffe, Tomlin, Russell of Killowen, and Wright heard the appeal of the Adelaide Electric Supply Co., Ltd., from the judgment of the Court of Appeal dismissing the company's appeal from the judgment of Mr. Justice Farwell in the Chancery Division granting a declaration that the plaintiffs, the Prudential Assurance Co., Ltd., as the holders of £11,000 5 per cent. "A" cumulative preference stock and £30,000 6½ per cent. "C" cumulative preference stock of the company and all other holders on the English register of the company of those stocks, were entitled to be paid their dividends in full in sterling and in England, and not as the appellants contended in Australian currency or its equivalent.

Mr. Wilfrid Greene, K.C., in support of the appeal, contended that the obligation to make payment of a specified number of pounds payable in Australia was satisfied by a payment of that which under the law of Australia was legal payment of that number of pounds. The question whether dividends were to be satisfied in Australian tender depended, he submitted, on the place of payment. Under a special resolution of the company, confirmed in February, 1921, all dividends were to be declared in Australia and to be paid in and from Australia. No differentiation, he contended, could be made between different preference stockholders based on the particular register on which their names might happen to be. He did not think there was any question that a company could provide that dividends should be paid in London in Australian notes.

Lord Atkin: If you had to argue it you would probably say that in this case there was no implied contract that the money was to be paid in English currency?

Mr. Greene: Yes.

Lord Atkin: In this case you are dealing with preference shares of a company operating in Australia receiving payment for the electricity it supplies in Australian currency, and that would lead to an inference that when the company made a payment it would make it in the same currency as that in which it was paid.

Mr. Greene agreed. He then dealt at length with the meaning of the word "sterling" and the various senses in which it could be used. He contended that if there was a contract by which a borrower in Australia contracted to pay in London so many pounds there was nothing to prevent him discharging that obligation in what was legal tender for such an obligation in Australia. Conversely if an obligation was incurred in London to pay pounds in Australia it was possible to provide in Australia a sum in English currency which was equivalent. When one analysed the true position the preference shareholders were bound by the resolution passed by the Adelaide Company, which limited the directors to paying in Adelaide or elsewhere in Australia.

When the Prudential Company took up the "C" shares on the terms of being bound by the memorandum it thereby necessarily accepted the position that the rights not only of the "A" shares but of all the "C" shares were going to be governed by the relative position of the "A" and the "C" shares according to the then extant resolutions of the company. He submitted that the appeal should be allowed.

Sir William Jowett, K.C., on behalf of the respondents, supported the judgment of the Court of Appeal.

At the conclusion of the arguments on Tuesday the hearing was adjourned until yesterday (Thursday).

Speedometers on Public Service Vehicles

The Bradford City Council has approved a decision of the Tramways' Committee to ask the Leeds Stipendiary Magistrate to state a case for the opinion of the High Court in respect of the recent conviction of the Bradford tramway manager for aiding and abetting an offence by a motor bus driver against the Road Traffic Act. The case was one in which the driver was alleged to have driven at a speed exceeding thirty miles per hour, and he admitted that his speedometer was not connected up. The tramway manager, summoned as an accessory, declared there was no statutory obligation to place speedometers on public service vehicles, and contended that as they were not yet strictly reliable on these heavy and frequently stopping and starting vehicles the Bradford Tramway Department did not utilise them in cases where the makers installed them on the buses. The Tramways Committee contends that the Leeds Stipendiary Magistrate wrongly interpreted the Act, and it considers it most important that the Department should know exactly what its position is in this matter.

The Cam Electrical Co., Ltd.

In the Companies Court, Chancery Division, on Monday last, Mr. Justice Maugham had before him a petition for the winding up of the Cam Electrical Co., Ltd.

There was no appearance by the company and his Lordship made the usual compulsory order.

Ashdown v. Vince Dry Batteries

Mr. C. M. Pitman, K.C., the Official Referee, has fixed January 15th next for the hearing before him of an action brought by Ashdown (Birmingham), Ltd., against Vince Dry Batteries.

A 220,000-V Air-blast Circuit-breaker

FOR use at a French station the Allgemeine Elektricitäts Gesellschaft is supplying what is said to be the highest voltage oil-less circuit-breaker that has so far been designed. It is for use on a 220,000-V system, and has a rupturing capacity of 1,500,000 kVA. Each of its single-pole elements comprises a switching column about 23 ft. high which rests upon a base forming a compressed air receiver, from which it can be conveniently withdrawn by means of a truck. The main contacts are at the top of each switching column. Inside each column a plunger type contact is moved upward when closing, and downward when opening, the circuit, by a crankshaft in the base which is driven by a compressed-air cylinder. The crankshafts of the three columns are rigidly coupled together by rod gear so that the three poles are closed and opened in synchronism.

The columns proper each comprise two hollow grooved insulators of very considerable dimensions, which are connected together by a metallic intermediate piece and insulate the contact parts of the breaker from earth as well as mutually when the breaker is open. Inlet pipes are fitted inside the columns for conveying the compressed air used for quenching the arc, hence the insulators are not subjected to pressure. A compressor is mounted immediately behind the breaker with all necessary accessories in a weatherproof housing, and the air is stored in the receivers of the individual poles at a pressure of 285 lb. per sq. in. The breaker is closed and opened by valves, which can be remotely controlled, or by hand direct at the breaker. By ingenious arrangements only a small amount of energy is necessary to actuate the valves, notwithstanding their unusual size, especially the opening valves, which must pass about 21 cu. ft. of air to the rupturing points of the breaker within a few hundredths of a second.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Import Duties Advisory Committee

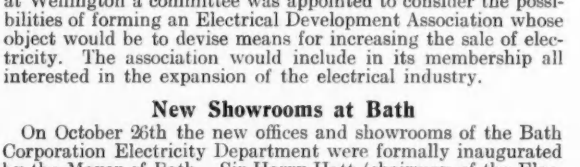
The Import Duties Advisory Committee has given notice of an application for a reduction in the import duty on magnet coils wound with aluminium wire adapted for use in electric hoists and separators. Any representations which interested parties may desire to make with regard to this application should be addressed in writing to the secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, S.W.1, not later than November 27th.

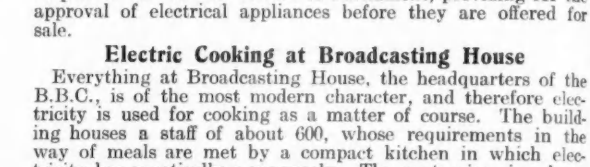
An Electrical Development Association for New Zealand

At the New Zealand Power Board's Conference recently held at Wellington a committee was appointed to consider the possibilities of forming an Electrical Development Association whose object would be to devise means for increasing the sale of electricity. The association would include in its membership all interested in the expansion of the electrical industry.

New Showrooms at Bath

On October 26th the new offices and showrooms of the Bath Corporation Electricity Department were formally inaugurated by the Mayor of Bath. Sir Harry Hatt (chairman of the Electricity Committee) and Lady Hatt were host and hostess, and after the opening ceremony the visitors made a tour of inspection of the suite of rooms. The new premises include an extensive showroom, a demonstration hall, an electric kitchen, offices for the staff, a sales department, store accommodation, &c. Some idea of the imposing nature of the showrooms can be obtained from the accompanying illustrations sent us by Mr. J. W. Spark, the city electrical engineer.





The imposing exterior of the new Bath electricity showrooms and offices and a view of one of the departments

The Electrical Contractors' Dinner

The annual dinner of the Electrical Contractors' Association has been provisionally fixed for January 23rd at the Savoy Hotel, London, W.C.

Unity Heating, Ltd.

Messrs. Barker, Young & Co., Ltd., will in future be known as Unity Heating, Ltd., which consolidates the interests of Barker, Young & Co., Ltd., Young, Osmond & Young, Ltd., and the Electro-Gas Development Co., Ltd. No change of policy or personnel is entailed in the change of name, but the rationalisation of the three companies is expected to result in increased efficiency and better service.

Copper Development Association

In view of the considerable developments which are taking place in the electrical industry more than usual interest and importance attach to the recent formation of the Copper Development Association, Thames House, Millbank, S.W.1, the registration of which was recorded in our issue of September 29th, page 430. The honorary presidents of the Association are Sir Auckland Geddes, Mr. A. Chester Beatty, and Sir Harry D. McGowan, and it is directed by a council of which Mr. D. Owen Evans, M.P., is chairman and Lt.-Col. the Hon. R. M. P. Preston vice-chairman. The conduct of detailed business is vested in a Management Committee, of which Mr. A. D. Storkes is chairman, and on which most of the important copper interests, including trade associations, are represented. The vice-chairman of this Committee is Mr. S. S. Taylor, other members being Messrs. W. R. Barclay, T. Bolton, J. C. Budd, G. W. Mullins, E. Pam, C. H. Schneider, and A. J. G. Smout. Mr. D. P. C. Neave is general manager and Mr. G. W. Preston, A.M.I.E.E. (as announced in the Personal Column of this issue), has been appointed electrical engineer. The object of the Association is to promote the use of copper and copper-containing materials, and for the present it is proposed to concentrate on the development of extended uses of copper rather than on research work, since it is felt that such development has not kept pace with the very rapid progress which research has made during the past few years. Contact has been established with the Copper and Brass Research Association in America, and with the Copper Institute of Germany with a view to the interchange of information.

Appliance Approval in New Zealand

A Bill is being prepared in New Zealand, which it is hoped to pass in the current session of Parliament, providing for the approval of electrical appliances before they are offered for sale.

Electric Cooking at Broadcasting House

Everything at Broadcasting House, the headquarters of the B.B.C., is of the most modern character, and therefore electricity is used for cooking as a matter of course. The building houses a staff of about 600, whose requirements in the way of meals are met by a compact kitchen in which electricity has practically a monopoly. The centrepiece is a large Falkirk Iron Co. range with four ovens and four 4-kW boiling sections in the top. The total loading of the range is 44 kW. A two-compartment pastry oven is installed; each compartment measures 26 in. by 30 in. by 12 in., and has a loading of 6 kW. This is also a "Falco" product, as are two 10-kW fish friers, two 4-kW grill-toasters, and a 4-kW warming plate. There is a 20-gallon (8-kW) stock-pot. The tea and coffee making apparatus (by Jackson Boilers, Ltd.) has a main 7-kW element with a 0.75-kW auxiliary element to keep the water boiling when it has reached that point; the equipment is thermostatically controlled. The Lightfoot Engineering Co., Ltd., has provided a two-compartment "Ellarcold" refrigerator and equipment for a cold storage room. Another useful appliance is a Berkel bread-slicing machine, which, of course, is electrically operated. Each piece of apparatus is separately switched and fused.

Bombay Electrical Industries

The Department of Industries in Bombay in its annual report refers to some interesting developments in the electrical industries in the Presidency in the past year. Two new factories have been established in Bombay for the manufacture of bakelite electrical fittings and two other factories are under consideration. An engineering concern in Bombay has taken up the manufacture of a.c. ceiling fans, and will manufacture table fans in the near future. A factory has been established in Bombay for the manufacture of neon electrical signs, the first of its kind in India, while factories have also been established for manufacturing dry cells for pocket batteries. The Department has investigated the possibilities of the manufacture of electric lamps and has prepared estimates regarding materials, machinery, expenditure and cost of production. According to this estimate, the smallest profitable concern would require a capital of Rs.170,000 and might be able to produce 780,000 lamps per annum, consisting of 60-W, 40-W, and 25-W gasfilled and vacuum lamps. Three electricity supply companies were also started during the year but their aggregate capital is small.

The Industrial Welfare Society

The Duke of York, presiding at the recent annual general meeting of the Industrial Welfare Society (Inc.), said that nobody could regard with complacency the figures published

by various Government Departments relating to industrial accidents, ill-health, lost time and disputes, and in them alone there was proof that need still existed for a voluntary body such as the Society. Not only industry, but, indeed, the country as a whole, stood to gain by the extension of the Society, which was not a charity but a mutual enterprise, and he would not be satisfied until every firm in the country was linked up with it in some way.

American Electrical Imports

The American official trade returns show that the imports of electrical machinery and apparatus into the United States during the six months ended with June last attained a value of £137,907, against £197,094 in the first half of 1932.

Modern Housekeeping

An exhibition designed to show what is implied by the term "modern housekeeping" is being run by Harrods Stores, Brompton Road, W. The exhibition takes the form of a series of rooms in which are displayed appliances of all kinds designed to keep a modern home clean and to ease the housewife's burden. Electricity plays a large part, and the G.E.C. has co-operated with Harrods in designing and equipping an "all-electric" kitchen and domestic laundry for this exhibition, as well as staging a wide array of its products for use in other parts of the home. In a model dining room and bedroom, adjoining the kitchen and laundry, the company has installed a variety of electrical appliances of the kind which would be used normally in these rooms, each of which is equipped with a new type of "Magnet" inset fire. Facing these rooms it has taken advantage of two stands to stage a selection of its smaller appliances, such as irons, toasters, water heaters, and the table-type hot plate which has recently been introduced, while adjoining the actual exhibition hall a space is occupied by the company in order to demonstrate the "Magnet" electric cleaner and electric polisher. Adjoining the exhibition rooms is a theatre specially equipped for lecturing and demonstration purposes, and here a series of talks has been arranged for each week of the exhibition. Last week lectures were given by Mrs. Tyrell, of the G.E.C., and Miss Haslett, director of the E.A.W.

An all-electric kitchen at Harrods equipped by the G.E.C.

An Increase in Wages

In May last we reported that Messrs. Partridge, Wilson & Co. had increased the pay of all employés at their Davenset Works by 5 per cent., with a promise of a further increase in the autumn. The company now announces that a 5 per cent. increase in wages was granted on November 3rd. It states that the effect of this policy was that the larger output hoped for has been considerably exceeded, resulting in the necessity for larger workshops. The new extension will be finished by the end of the year.

A Cinematograph Exhibition

An exhibition is to be held at Dorland Hall, 18-20, Regent Street, S.W., from November 27th to December 9th, to encourage the use of cinematograph films in the home, lecture room and industry. The latest standard and sub-standard home and industrial cinema equipment will be demonstrated, together with sound-recording and re-recording systems, film developing, printing plant, etc. Sections will be allocated to educational, cultural and publicity films, and amateur cinematographers will have the opportunity of taking pictures, as three separate studios are being erected for their use.

D.O.T. Radio Market Reports

According to a recent Department of Overseas Trade Report, sales of United Kingdom radio apparatus in Poland are small, the high duty and the lack of buyers for expensive sets rendering competition with local manufacturers extremely difficult. It is advised that business should be done through an agent; it will, however, be difficult to find anybody capable of financing transactions himself, and it will accordingly be necessary to supply goods on credit, probably freight and duty paid.

Suggestions for popularising British radio equipment are also given in a similar report relating to the trade in Trinidad, Bermuda, British Guiana, Bahamas and British Honduras. United Kingdom manufacturers are advised to concentrate on the production of short-wave sets, bearing in mind that price as well as efficiency is of great importance.

Social Events

The annual staff dinner of British Insulated Cables, Ltd., was held at the Adelphi Hotel, Liverpool, on November 3rd, a company of 680 being present. The reply to the toast of the company was made by the Hon. Sir Arthur Stanley, G.B.E., a director, who reminded those present that one of the company's earliest ventures was the laying of a main cable, forty years ago, from Prescot to the estate of his uncle, the then Lord Derby, at Knowsley. He recollected that the King, then Prince of Wales, visited Knowsley on one occasion and expressed a wish to see a house lighted by the new system. He concluded his speech with a reference to the team-work of the staff, attributing to this and to consistent excellence of manufacture, the present-day stability of the company. In addition to Sir Arthur Stanley and Mr. G. H. Nisbett the company included Messrs. E. Taylor, director, J. R. Robinson, M.P. for the Widnes Division, D. J. Carlton Stitt, a former director of the B.I., and Col. Bates, who was, until his recent retirement, works manager at Prescot for many years. After dinner, a variety entertainment was given, whilst a whist drive and dance completed a pleasant evening. Telegrams expressing good wishes were received from Sir Alexander Roger, chairman, and Mr. J. Ferguson, vice-chairman of the company, who were unable to be present.

An enjoyable evening was spent at the Café Royal, Regent Street, W.1, on October 31st, when members and ex-members of the London Electricity Supply Association met at dinner to pay tribute to Mr. R. G. Rawkins, J.P. (director, manager, and secretary of the Notting Hill Electric Lighting Co., Ltd.), who has been a member of the Association for twenty-seven years, and its chairman for the past two years, and to mark the occasion of his birthday and the completion of his second period of office as Mayor of Windsor. The chair was taken by Mr. G. W. Partridge (formerly managing director of the London Electric Supply Corporation), supported by Mr. A. F. Harrison, managing director of the City of London Electric Lighting Co., Ltd. Mr. Partridge recounted the early experiences of the fourteen London companies, and concluded by presenting Mr. R. G. Rawkins with a silver salver engraved with the names of all the present and the immediate past members of the Association. Mr. Rawkins, in responding, recalled many interesting incidents which had occurred during his two periods of office as Mayor of Windsor, and said that it would be his greatest pleasure to continue to help in the work of the Association. Mr. A. F. Harrison spoke of Mr. Rawkins's ability and fairness of judgment, which as chairman of the Association he always displayed at the regular meetings of the Association and its Executive and other Committees.

Over 500 members attended the opening dance of the season promoted by the Barnsley Corporation Electricity Works Social Club. There was an elaborate scheme of electrical illuminations.

New Premier Fires

In our description of these fires in our last issue (page 630) we incorrectly gave the company's address as "Ruby Street," Birmingham; it should have been Keeley Street. The effect obtained in these fires is not a "flicker," for the company's efforts have been directed towards avoiding this in an attempt to reproduce the movement of smoke and flame in a realistic manner.

Trade Announcements

Mr. W. J. Creemer, electrical engineer and contractor, has opened a new showroom at 90, Broad Street, Blaenavon, and asks for catalogues.

The business of Messrs. Albert E. Sudlow & Co., electrical engineers and contractors, 60, George Street, Manchester, has now been taken over by Messrs. Albert E. Sudlow & Co., Ltd.

The Universal Winding Co., through its executive manager for Great Britain, Mr. Frank Nasmith, will in future act as agent for Mr. Charles B. Johnson, of Paterson, New Jersey, the maker of the Johnson sizer, in Great Britain and Northern Ireland. Any inquiries in respect of this particular type of machine should be addressed to the company at Saville Street, Oxford Road, Manchester.

The Whitworth Electric Lamp Co., Ltd., has purchased from the liquidator of Electric Lamp Factors, Ltd., that company's Portsmouth branch which formerly traded as Wall and Attwooll. A company will be formed as Wall & Attwooll, Ltd., and Messrs. F. G. Wall and H. A. Attwooll will be joint

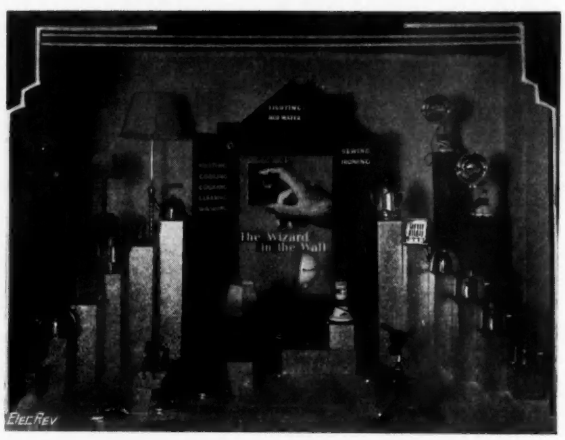
managing directors, the whole of the share capital being held by the Whitworth Electric Lamp Co.

Messrs. Collins, Brown & Co., Ltd., have opened a wholesale and export electrical and radio department at 91, New Oxford Street, W.C.1.

Messrs. William Geipel, Ltd., 156-170, Bermondsey Street, S.E.1, have been appointed sole agents in this country for "Ringsdorff" arc-lamp carbons.

The E.D.A. November Programme

The November programme of the British Electrical Development Association draws special attention to the Autumn Press advertising campaign and illustrates a window display for November connecting with the campaign advertising. As will be seen from the accompanying illustration, the central display unit is a model proscenium in which is placed a photographic cut-out of hand and switch, with a lettered panel underneath, "The Wizard in the Wall." The programme includes a number of suggested local advertisements and gives particulars of cooker hire and "The Wizard in the Wall" posters. Preliminary announcements are made of the forthcoming publication of the E.D.A. calendar for 1934 and a folder describing



The E.D.A. November window display

a number of Christmas window displays. A mechanical window display has been designed which it is hoped to have ready shortly for hire to members. The usual price list of seasonable literature is included. With the programme a leaflet has been issued giving particulars of E.D.A. display signs for delivery vans.

For Sale

The North Eastern Electric Supply Co., Ltd., has a 300-cell storage battery for sale.

(See our classified advertisements.)

Italian Radio Imports and Exports

The imports of radio receiving sets and apparatus into Italy during the seven months ended with July last attained a value of £164,950, as compared with £195,850 in the corresponding seven months of 1932. There was also a decline during the same period in the exports of similar material from Italy, from £37,484 to £23,484.

Lantern Slides for Lectures

Messrs. Edward Bennis & Co., Ltd., have a large number of lantern slides dealing with mechanical stokers and mechanical coal and ash-handling plant for loan to societies, institutions or individuals for lecture purposes. Particulars of these slides can be obtained from the company's offices at 28, Victoria Street, S.W.1, or from its works at Little Hulton, Bolton.

The General Electric Co., Ltd., has prepared a lecture dealing with the main constructional features and points of interest in the manufacture of Osram "Catkin" valves. A series of twenty-three lantern slides serves to illustrate the lecture. This lecture and slides are primarily intended for use by technical institutions and societies, and will be lent to responsible persons. Application for the lecture and slides should be made to the head office and to the main branches of the company throughout the country.

Recent Contract

The M.V. *Malaita*, built by Messrs. Barclay Curle & Co., Ltd., Glasgow, for Messrs. Burns, Philip & Co., Sydney, Australia, has been fitted throughout with "Royal Ediswan" lamps, "Virite" cable, Ediswan cygnet switches, fires, and stationary batteries for l.p. circuits.

Practical Education in Yorkshire

A report has recently been issued by the Yorkshire Council for Further Education upon the classes held in the county for education and training for electrical installation work. The report states that the majority of technical institutions in Yorkshire providing courses in installation work follow the course which has been recently drawn up by a representative Advisory Committee of the City and Guilds of London Institute. The Institute syllabus for a course for junior electricians of from fourteen to sixteen years of age has not yet been established in any school or college in Yorkshire. The report states that the Institute, in conjunction with the Electrical Contractors' Association, awards an Electricians' Interim Certificate on the result of an examination at the end of the third year. The Institute has further made provision for an Interim Extra Certificate, and for an Extra Certificate to be awarded to students who complete a further one or two years' study of mathematics. The scheme for Electrical Installation Work set out in the programme of the City and Guilds of London Institute has the Committee's full support, and it recommends its adoption as widely as possible throughout the county. The Committee feels, too, that systematic training in craftsmanship should be the chief aim in every practical class. In order to assist the various authorities, the Committee has compiled a schedule showing the necessary accommodation and equipment needed for these classes, which would be of very great help when forming classes.

The Committee has also issued a report upon classes in electrical engineering intended for young employés concerned with the generation and distribution of electricity. The report recommends the system of training adopted by the Barnsley Corporation Electricity Department where boys are usually recruited to the Department at the age of about fifteen either from a senior elementary school or from a grammar school. On entering the department they are trained as apprentice electricians, and on passing certain tests boys are selected for an engineering apprenticeship as vacancies occur in the electrical engineering department.

Russian Telephone Apparatus Developments

It is announced from Moscow that the Soviet authorities have decided to prohibit the import of telephone apparatus. On the other hand, they have resolved to begin the export of telephone apparatus, and it is reported that a large quantity will shortly be offered for sale abroad at low prices.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price, November 28th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. less 6 per cent.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti friction Metals—		
Grade I ... ... per ton net	£203	£3 inc.
Grade II ... ... ,,	£139	£1 inc.
Grade III ... ... ,,	£68	£1 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	7d.	¼d. dec.
c ,, Tubes (solid drawn) ... ... ,,	9d. to 9½d.	—
c ,, Wire, basis ... ... ,,	7½d.	½d. dec.
c Copper Tubes (solid drawn)... ... ,,	10d.	½d. dec.
g ,, Bars (best selected)... ... per ton	£62	£2 dec.
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£42	—
d ,, ,, Sheets ... ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£14	£1 dec.
d ,, ,, H.C. Wire ... per lb.	7 1/16d.	1/16d. dec.
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	4¾d.	¼d. dec.
i Iron, Pig (Cleveland No. 3) ... per ton	62/6	—
i ,, Wire, galv. No. 1, P.O. qual. ,,	£20	—
g Lead, English Pig ... ... ,,	£13 5s.	5s. inc.
g Mercury ... ... per bot.	£9 15s. to £10	—
e Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11d.	—
p ,, ,, rolled strip & sheet ,,	11d.	—
p ,, ,, wire ... ... ,,	1/-	¼d. dec.
o Platinum ... ... per oz.	£7 15s.	—
d Silicium Bronze Wire ... ... per lb.	8 3/16d.	1/16d. dec.
r Steel, magnet, in bars ... ... ,,	7½d.	—
n Tin, Block (English) .. .. per ton	£225 5s. to £227 5s.	£1 15s. inc.
g ,, Wire, Nos. 1 to 16 ... ... per lb.	3/5	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
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n P. Ormiston & Sons.
o Johnson Matthey & Co.
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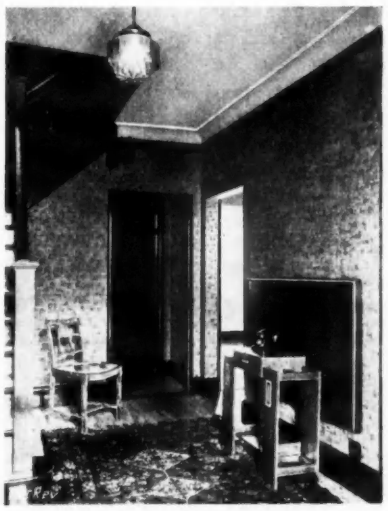
r W. R. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium, bronze wire, lead and rubber, up to the time of going to press, are given in our "Business Notices" under the same heading.

An " All-electric " House

An " all-electric " house has recently been completed at Ipswich, which is warmed in the main by an " Ediswan " low-temperature heating installation. Skirting panel heaters were decided upon as being less obtrusive than the tubular type and more in harmony with modern decorative ideas. These are thermostatically controlled. These heating arrangements are supplemented in the lounge and dining room by electric imitation coal fires, and in the bedrooms by electric fires set flush in the walls. One hundred feet of skirting panels are installed, which, together with a large wall panel used in the hall (shown in the accompanying illustration), take a total load of 7.32 kW. The water heating arrangements consist of a 2-kW " Ediswan " immersion heater, thermostatically controlled, and a 3-kW " Ediswan " immersion heater. The latter is hand-controlled and is used for rapid heating in the event of an extra heavy demand for hot water. The house was built by Messrs. J. R. Self & Sons, the electrical contractors being Messrs. A. W. Fisher. Both are Ipswich firms. The Ipswich Electricity Department co-operated in the scheme, and has allowed the owners of the house a special low rate for all electricity consumed.



Panel heating in the hall of an " all electric " house

Another Diesel-electric Ship

Messrs. David MacBrayne (1928), Ltd., of Glasgow, who operate a number of passenger, mail and cargo services between Glasgow, Oban, Fort William, Inverness and the Western Highlands and Islands, have placed an order for a Diesel-electric ship for their Portree service with Messrs. Wm. Denny and Bros., Ltd., Dumbarton. Messrs. Davey Paxman (Colchester), Ltd., will supply two 600-h.p., 500-r.p.m. six-cylinder heavy-oil engines, and the General Electric Co., Ltd., will be responsible for the electrical equipment, which will include the G.E.C. type of bridge control. MacBrayne's in 1931 took delivery of what was the first British Diesel-electric passenger ship built for service in home waters; this vessel, the *Lochfyne*, was built for the summer holiday service between Oban, Staffa and Iona, and for the winter service between Greenock and Ardrishaig. It must be assumed that the success of this vessel has led to the owners deciding to employ the Diesel-electric drive on the ship now ordered. They are said to be considering the ordering of further vessels.

Dutch Import Quotas on Electrical Products

The Dutch Government has issued an ordinance introducing import quotas for electric vacuum cleaners for a period of six months from October 1st. The quota corresponds to the average number of such cleaners as were imported in the corresponding six months of 1930, 1931, and 1932. Quotas have also been fixed for rubber-insulated copper wire and cables. The imports per quarter are not to exceed 75 per cent. of the average quarterly imports in 1931 and 1932. Moreover, the existing import restrictions on glow lamps have been extended for six months.

New Catalogues and Lists

Ransomes, Sims & Jefferies, Ltd., Orwell Works, Ipswich.—A well-produced brochure illustrating the company's trolley-buses, a large number of the pictures showing the buses in actual service both in this country and abroad.

Premier Electric Heaters, Ltd., Keeley Street and St. Andrew's Road, Birmingham.—List No. 246 dealing with " Premier " bowl fires.

British Electric Domestic Appliances, Ltd., 3, Hanover Court, Moor Lane, E.C.—The " Mary-Ann Advertising News," giving details of the company's forthcoming national campaign for advertising the " Mary-Ann " vacuum cleaner.

Star Electro Carbons, Cleveland Road, E.18.—A number of leaflets relating to glass commutator brushes, industrial carbon brushes, the " Little Giant " dust bellows, the " Star " dust bellows, vacuum cleaner brushes, &c.

C. A. Parsons & Co., Ltd., Heaton Works, Newcastle-upon-Tyne.—Leaflets Nos. 32 and 43 covering Parsons welded steel structures and Parsons silvered glass reflectors, respectively.

Butterworth Bros., Ltd., Newton Heath Glass Works, Manchester.—An illustrated catalogue of industrial and illuminating glassware, glass tubing, rod and cane, &c.

David Brown & Sons (Hudd.), Ltd., Huddersfield.—Publication No. F452-1, fully describing spiral bevel gears for heavy duty. A number of excellent illustrations of installations carried out by the company are included.

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, W.C.—Publication A.B.939, containing particulars and prices of starting and lighting batteries for commercial vehicles, and H.C.940, illustrating the " Trinity " heating system in a sixteenth-century home.

Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, E.C.—Leaflet No. 1650, giving brief particulars of the " Elect " electric fire.

Venner Time Switches, Ltd., Kingston By-Pass Road, New Malden.—A card illustrating the Venner hour meter.

S. P. Catterson & Sons, Ltd., " Globe " Lamp Works, Newington Causeway, S.E.—A comprehensive catalogue (sixty-four pages) of lampshades, lanterns, pendants, fires, and other electrical equipment.

Revo Electric Co., Ltd., Tipton, Staffs.—A pamphlet relating to chromium-plated floodlights, spotlights, reflector fittings, &c.

Elliott Bros. (London), Ltd., Century Works, Lewisham, S.E.13.—An illustrated booklet (catalogue 840) describing Siemens electrical distance thermometers.

Cambridge Instrument Co., Ltd., 45, Grosvenor Place, S.W.1.—A folder illustrating Cambridge index thermometers and thermographs.

Sun Electrical Co., Ltd., 118-120, Charing Cross Road, W.C.—A fully illustrated and comprehensive catalogue (No. 598), containing over 200 pages relating to radio loud speakers, components and accessories.

English Electric Co., Ltd., Queen's House, Kingsway, W.C.—Publication K.27B, illustrating bus bodies supplied by the company to various transport authorities, Q.47, giving particulars of the e.h.p. fuse unit, type R.D., P.99A, relating to type D.D. vertical isolation drawout (metal-enclosed) switchgear, and an illustrated folder of the A.E.C.-English Electric, 63-seater, Q-type trolley-bus.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.—A folder (O.S.6666), illustrating in colour " Osram " decoration lamps.

Bankruptcy Proceedings

E. H. Jones, Northcote Buildings, Undercliffe, Bradford, electrician and radio dealer.—The public examination herein was closed at the County Court, Bradford, on November 3rd. Debtor had returned a statement of affairs showing liabilities of £457, with an estimated deficiency of £384, and attributed his failure to loss in connection with bad hire-purchase transactions and ill-health.

A. Sudds, electrical engineer, The Café, Apple Tree Corner, Gerrards Cross.—Receiving order made October 31st on debtor's own petition.

R. McKay, wholesale electrical dealer, 134, Bradford Road, Idle, Bradford.—Receiving order made October 24th on debtor's own petition. Public examination December 8th at the County Court, Manor Row, Bradford.

T. E. Harvey, radio and electrical engineer, 64, Leagrave Road, Luton.—Receiving order made October 24th on debtor's own petition. First meeting November 13th at 6, The Parade, Northampton. Public examination November 17th at the Court House, Luton.

J. Stewart, radio dealer, 10, Murton Street, Murton Colliery, Durham.—Last day for receiving proofs for dividend November 11th. Trustee, Mr. W. A. Ellis, 32, Frederick Street, Sunderland, Official Receiver.

S. D'Este, radio dealer, 10, Station Road, Finsbury Park, N.—Receiving order made October 27th on a creditor's petition. Public examination December 20th at Bankruptcy Buildings, Carey Street, W.C.

Company Liquidations

Clifford & Snell, Ltd., electrical engineers, designers and manufacturers, 63, Sumner Road, West Croydon.—The statutory first meetings of the creditors and shareholders were held on October 31st at Carey Street, W.C. The winding-up order was made on October 9th on the petition of creditors, and a statement of affairs has been lodged showing liabilities of £1,653 against assets of £804, and a deficiency of £3,549 with regard to contributories, the issued capital amounting to £2,700. The failure was attributed by the directors to difficulty in obtaining finance, but in the opinion of the Official Receiver it was due to lack of sufficient capital and to dissensions between the directors. The liquidation was left in the hands of the Official Receiver.

Kelvin Accumulator Co., Ltd., 42-44, Orchard Street, Swansea.—The statutory meeting of creditors was held recently at the company's offices, when the statement of affairs showed liabilities of £2,912 and net assets of £1,321, leaving a deficiency of £1,591. The issued share capital of the company was £4,986, making a total deficiency of £6,577. It was stated that the shareholders had passed the usual resolutions for liquidation, and it was resolved to confirm the appointment of Mr. L. S. Findlay, Windsor Place, Cardiff, as liquidator, with a committee of inspection.

Smithfield Markets Electric Supply Co., Ltd.—Meeting, November 28th at 31, Throgmorton Street, E.C., to receive an account of the winding-up by the joint liquidators, Messrs. G. E. Leon and W. H. Percival.

Henry Jackson & Co., Ltd.—Meetings, December 7th, at 1 and 2, Bucklersbury, E.C., to receive an account of the winding-up by the liquidator, Mr. F. S. Salaman.

Hawkers, Ltd.—Particulars of claims by November 30th to the liquidator, Mr. H. B. T. Wilde, 45, Newhall Street, Birmingham.

Marlborough Radio Co., Ltd.—Winding up voluntarily. Liquidator, Mr. N. G. Rees, 12, Church Lane, Oldham.

Dissolutions of Partnership

Driver Bros., wireless goods dealers, Ivegate, Yeadon.—Messrs. F. S. Driver and J. H. Driver have dissolved partnership. Mr. J. H Driver will attend to debts and carry on the business.

Pocock & Green, dealers in wireless apparatus, 48, Cannon Hill, Southgate, N.14.—Messrs. P. Pocock, A. G. Cooper and H. L. Lewis have dissolved partnership. Mr. Pocock will attend to debts and carry on the business in partnership with Mr. Lewis.

Electricity Supply

Lighting, Domestic, Power

Aldershot.—ASSISTED WIRING.—The Town Council is considering a scheme for wiring houses on easy terms, and the Electricity Committee has recommended that a rate of 2d. per kWh on the prepayment rate be approved, and that a standard specification for competitive tenders from local traders for wiring houses should be prepared. The latter recommendation has been approved, but the former has been referred back to the Committee with a view to a more equitable "unit" charge being arranged.

Ammanford.—CHANGE-OVER.—The change-over in the electricity system from d.c. to a.c. by the Llanelly and District Electric Supply Co., Ltd., took place last week.

Bacup.—SUPPLY PROGRESS.—Forty applications for supplies, and twenty-three applications for additional facilities, have been received, and in addition there are several schemes for laying cables in different districts. The Electricity Committee is considering the letting out on hire of wash boilers and water heaters, and the assisted-wiring charge has been reduced.

Barnstaple.—EXTENSIONS.—The Town Council has applied to the Electricity Commissioners for sanction to the appropriation of £2,000 from the reserve fund for prospective capital expenditure for mains, services and meters.

Barrow-in-Furness.—EXTENSION.—The Electricity Committee is to extend mains at a cost of £240 to supply new houses in Roose Road, and street lighting on the Roosegate Estate at a cost of £270.

LOAN.—The Electricity Committee is applying for sanction to a loan of £5,000 for sub-station switchgear and transformers.

Belgium.—ELECTRICAL OUTPUT.—A return issued lately shows that at the end of last year there were 273 electric power stations with a combined capacity of over one million kW in Belgium. The Province of Hainaut leads with 89 plants, followed by that of Brabant 52, Liège 51, Eastern Flanders 32, Antwerp 19, Limburg 10, Namur 9, Western Flanders 6, and Luxembourg 5. Steam-operated stations with a total of 254 represent over 93 per cent. of the total, and plants operated by internal-combustion engines are responsible for 32 per cent. of the total power production.

Coatbridge.—TRANSFER OF ELECTRICITY SUPPLY.—An agreement has been reached between the Town Council and the Clyde Valley Electrical Power Co. for the transfer of the Coatbridge and Airdrie Electric Supply Co.'s undertaking to the Town Council, and then for its immediate re-transfer to the Clyde Valley Co. The draft agreement is now before the Electricity Commissioners for their approval, and when this is secured the agreement will be embodied in a Standing Order and submitted to Parliament on November 27th.

Barmouth.—SUPPLY TO DYFFRYN.—The North Wales Power Co. is to commence work on the construction of lines to convey a supply of electricity to Dyffryn. The question of supplying Talybont is also being discussed.

Bromley.—LOAN.—The Council is to borrow £20,000 for mains and services.

Croydon.—PARISH CHURCH FLOODLIGHTING.—It the accompanying illustration, which was sent to us by Mr. F. N. Rendell-Baker, chief engineer and manager of the Corporation

Croydon Parish Church floodlighted by Ediswan equipment

electricity undertaking, we show the Croydon Parish Church, which was floodlighted in connection with the recent Croydon Church General Mission. The wiring for the scheme was carried out by Messrs. F. Wingfield, and the floodlights, &c., were supplied by the Edison Swan Electric Co., Ltd.

Dewsbury.—SUPPLY TO CROWN MILLS.—Permission has been granted to the Yorkshire Electric Power Company for supplying electricity to the premises known as Crown Mills, Savile Town.

East Elloe.—EXTENSIONS.—The Rural District Council has been informed that the Boston Electricity Co. is to extend a branch h.p. line to Godney Dyke for a supply to the district.

Edinburgh.—FLOODLIGHTING.—The project of adding more light to the Christmas and New Year festivities was discussed further in the City Chambers on October 30th. For those desirous of floodlighting their premises information is to be available from the engineer and manager of the Corporation Electricity Department. It is understood that electricity for the purpose may be obtained at 1d. per kWh. The meeting discussed the possibility of enlisting the aid of private householders, who, it was suggested, might light up rooms of their houses which are normally unlighted. Princes Street shopkeepers suggest that the Town Council should waive the ordinary restriction on the use of coloured lights.

Fife.—COUNCIL'S TENANTS WANT ELECTRICITY.—The tenants of the Fife County Council's housing schemes at Glebe Park, East Wemyss, recently sent a petition to the Council asking that electricity should be installed in their houses in place of gas. The Council has replied that the installation of electricity will be undertaken provided the tenants pay part of the cost of the change-over. In its later schemes the Council has installed electric light.

France.—OUTPUT OF ELECTRICITY.—The output of the sixty-five principal electric power stations in France, representing about 94 per cent. of the aggregate production in the country, amounted during August last to 823,303,958 kWh, bringing up the total production for the first eight months of the year to 6,537,200,890 kWh, as compared with 6,043,178,300 kWh in the corresponding period of 1932. Of the total, hydro-electric plants were responsible for 3,857,906,704 kWh, and steam and internal-combustion-engined stations for 2,679,294,186 kWh.

NEW STEAM GENERATING PLANT.—The first section of an important steam-operated power station at the collieries at Mazingarbe of the Compagnie des Mines de Bethune has recently been completed. The full scheme provides for the installation of two 31,250-kVA turbo-alternators, two of 43,750 kVA and three auxiliary sets of 5,000-kVA capacity. The initial plant now in operation comprises the two 31,250-kVA sets and two of the auxiliary groups. The necessary steam is provided by a battery of Babcock and Wilcox boilers fired with pulverised fuel.

Gringley.—PUBLIC LIGHTING.—The Parish Council has accepted the quotation of the Retford Corporation Electricity Department for public lighting.

Halesowen.—REDUCED CHARGES.—The Shropshire, Worcestershire and Staffordshire Electric Power Co. is to reduce its lighting charge from 6d. to 5d. per kWh.

Heston Isleworth.—SALE CONTEMPLATED?—The recently constituted Corporation proposes to apply to the Electricity Commissioners for permission to insert in the Heston and Isleworth Electric Lighting Order, 1900, a clause enabling the Corporation to sell its undertaking should it so desire. The Electricity Committee has recommended that such a clause is desirable because it would enable the Corporation to supplement any case it might submit to its bulk supplier (the Metropolitan E.S. Co.) for a reduction of price. The Mayor, who is also chairman of the Electricity Committee, has stated that the Council is buying about 25 million kWh a year, and unless it has a weapon with which to bargain it will never obtain a reduction of price. An offer in the neighbourhood of £500,000 is said to have been made by Messrs. Botsfords.

ELECTRICITY IN FLATS AND HOUSES.—A building firm has applied to the Heston Isleworth Corporation for permission to erect 400 flats without chimneys on the Lyon Lane Estate. They are to have all-electric lighting, heating, and cooking. When the Borough Council's Martindale Road Estate houses were erected it was decided that they should be all-electric. There was some controversy at the time about tenants' rights to choose between electricity and gas. The cost of electrical operation is now causing dissatisfaction, and some residents on the estate are asking for the removal of their electric cookers. Since the passage through Parliament of the Gas, Light & Coke Co.'s Act prohibiting the placing of any restriction on the use by tenants of council houses of any particular form of light, heat, or power, the Gas Co. has laid mains on the estate and a number of tenants have had gas cookers installed.

India.—ELECTRIFICATION IN THE PUNJAB.—A statement issued by the Punjab Electricity Department says that efforts are being made to bring within the compass of the Mandi hydro-electric scheme as much of the province as is feasible. Energy from this scheme is now available to seven towns—Pathankot, Gurdaspur, Dinanagar, Batala, Amritsar (suburbs), Kasur and Ferozepore. In the near future nine more towns will have a supply, namely, Tarn, Taran, Baghbanpura, Chuhrkana, Jaranwala, Nankana Sahib, Shaikpura, Lyallpur, Ludhiana, and also the suburbs of Lahore.

MORE ELECTRICITY IN MYSORE.—A considerable increase in the use of electricity in Mysore is shown by figures given by Sir Mirza Ismail, the Dewan, in a speech at the opening of the Mysore Representative Assembly. In the course of a survey of engineering activities during the past year he said that the quantity of power generated during the year was 178,340,592 kWh, compared with 171,045,180 kWh last year. The total number of power and lighting installations, exclusive of those installed in buildings belonging to the Kolar mining companies, at the end of June, 1933, was 2,200 and 19,312 respectively, against 1,763 and 16,761 at the end of June, 1932. The electrification of Mulbagal, Chintamani, Devanhalli, and Goribidnur was proceeded with, the last two towns being

supplied with power. Service was given to a large number of villages in the Kolar goldfield, Kankanhalli, Bangalore, and Mysore power and lighting sections. At the end of June the total capital invested in rural electrification schemes was Rs. 19,02,158. Estimates in connection with the electrification of Chamrajnagar, Yedatore, and Hunsur are under consideration.

Ipswich.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains from the power station to two sub-stations at a cost of £3,030.

Kingston-on-Thames.—REVISED CHARGES.—We are informed by Mr. T. A. Kingham, borough electrical engineer, that the new tariff for continuous heating mentioned in our last issue was incorrectly stated. The correct tariff is as follows: Between 8 p.m. and 8 a.m., 3 kWh a penny, and between 8 a.m. and 8 p.m., ¾d. per kWh.

London.—ELECTRIC LIGHTING.—The London County Council is to install electric lighting in many of its pre-war dwellings at a cost of £8,900.

Longbenton (Northumberland).—OBJECTION TO CABLES.—Objection is to be offered by the Urban District Council to a proposal by the North Eastern Electric Supply Co., Ltd., to erect overhead cables at Killingworth.

Lune.—CABLE OVER THE WYRE.—The Board of Conservators has decided to offer no objection to the carrying of an electric cable over the River Wyre at Wardley's Ferry, provided it is 55 ft. above high-water level.

Maidstone.—MAINS EXTENSIONS.—The Town Council has sanctioned mains extensions estimated to cost £2,134.

Millom.—EXTENSIONS NOT APPROVED.—The Electricity Commissioners have informed the Urban District Council that they are unable to approve proposals to extend the electricity supply to Silecroft, Bootle, and Green, in the rural area. The Commissioners say that any question of undertaking this work should be deferred until such time as the proposed amalgamation with the Bootle Rural District Council takes place. The Council has asked the Commissioners to consider its application first in view of any other undertaking making a similar proposition.

Newport (Mon).—REDUCED CHARGES.—The Corporation is to revise its charges as follows: Lighting, first 1,500 kWh 5d. per kWh, all in excess 4½d.; where a minimum consumption of 10,000 kWh is guaranteed the charge will be 4½d. Small industrial power, first 1,000 kWh at 2d. per kWh, next 10,000 kWh 1½d., over 11,000 kWh 1d. It is also proposed, under the special lighting rates for power consumers of not less than 1,500 kWh a quarter energy for lighting, to charge the equivalent of 20 per cent. of the power consumption at power rates, the amount in excess to be charged at ordinary lighting rates. The heating rate is to be ¾d. per kWh if thermostatically controlled, or if consumed between 6 p.m. and 8 a.m. It is recommended that the concession of allowing the low rate of 2d. a kWh for shop window lighting from 2 p.m. to 6 p.m. during part of December and January be discontinued. The fixed charge of 15 per cent., combined domestic rate, is to be limited to a minimum of £2 10s. in the borough.

Northern Ireland.—BELFAST.—The Corporation Finance Committee has sanctioned the application of the Electricity Committee to raise a loan of £130,000 for the extension of the electricity distribution system.

Poland.—ELECTRICITY OUTPUT.—The output of electric power by the various generating stations in Poland during the first six months of the current year is estimated to have amounted to about 1,028 million kWh, an increase of 2.3 per cent. over that during the corresponding half of 1932.

Pontardawe.—LOAN.—The Council has applied for sanction to borrow £5,600 for the development of its electricity undertaking.

Portsmouth.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a total estimated cost of £492.

Rotherham.—NEW TARIFF.—With the introduction of the new tariff of ½d. per kWh for heating, a meter rent at the rate of 3d. per week has been charged to consumers using slot meters for heating, and the electrical engineer has recommended that, to avoid meter rent, an alternative inclusive tariff of ¾d. per kWh for heating be offered to this class of consumer.

Sabden (Lancs).—MAINS EXTENSIONS.—The Lancashire Electric Power Co. has informed Burnley Rural District Council of its intention to lay electric cables in various streets in Sabden.

Scarborough.—SUPPLY TO WYKEHAM ABBEY.—The Electricity Committee has obtained sanction to borrow £803 for a supply of electricity to Wykeham Abbey.

Sheffield.—EXTENSIONS.—The Electricity Committee has approved expenditure on extensions of mains, &c., amounting to £3,962.

ELECTRIC CLOCKS.—Houses now in course of construction at Listerdale, to let at 12s. 6d. per week, exclusive of rates, are to be fitted with electric clocks.

SUB-STATION.—The Electricity Committee is to erect a sub-station in Wood Lane on the Woodlands Housing Estate.

Sleaford.—EXTENSIONS.—The Urban District Council, having arranged to give a supply of electricity to the works of Bass & Co. and C. Sharpe & Co., has decided to lay cables free of charge along Kesteven Street in the event of electric light being installed at the Sessions House, police station, &c.

Southend-on-Sea.—STREET LIGHTING.—In June of this year the Town Council decided to convert the whole of the gas street lamps in the borough to electricity. Mr. A. C. Johnson, the borough electrical engineer, tells us that the work commenced this week, and it is anticipated that the 2,381 gas lamps will be converted in about six months. The side streets are lighted from dusk to dawn, whereas a portion of the main streets are lighted from dusk to midnight, and all the lamps will be automatically controlled; when the conversion is completed Southend will have about 4,325 lamps automatically controlled.

South Shields.—REDUCED CHARGES.—The Electricity Committee has decided that the charge for electrical energy used for domestic heating and power purposes shall be reduced from 1d. to ¾d. per kWh, and recommends the borough electrical engineer to prepare proposals for the hiring out of domestic apparatus.

Stoke-on-Trent.—SUPPLY IMPROVEMENT.—The Electricity Committee is to improve the supply in the Victoria Road area of Tunstall at a cost of £2,900.

CHANGE-OVER.—The Electricity Committee is considering a scheme for the change-over of supply in a section of the Tunstall area at an estimated cost of £4,000.

Sutton Coldfield.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains to new housing estates (£1,566).

Uckfield.—REDUCED CHARGES.—The Urban District Council has reduced the charge for power to ¾d. per kWh, subject to certain technical conditions.

Wigton (Cumberland).—OVERHEAD LINES.—Application is to be made by the Mid-Cumberland Electricity Company for permission to erect overhead lines from Wigton to Thursby.

York.—EXTENSIONS.—The Electricity Committee is applying for sanction to borrow £6,314 for the provision of electricity to the villages of Dunnington, Murton, Elvington, and Wheldrake.

Traction

Brazil.—RIO UNDERGROUND RAILWAY.—The Rio de Janeiro Municipality is to call for tenders for the projected underground railway at the end of this year. A proposal is afoot whereby the Municipality will be able to pay off the debt by means of coffee shipments instead of by monetary payments, should the contract for the work go to an Italian firm, as a combine among the large Italian coffee-importing firms is being formed with the object of helping Italian engineering firms to secure this contract.

Brighton.—MERGER SCHEME.—The three notices of motion relative to the recent traffic merger with Messrs. Tilling, and advocating the municipal control of transport in the whole district, were defeated at a meeting of the Council last week.

Dewsbury.—TRAM TRACK RENEWAL.—The National Electric Construction Co. has agreed to pay £550 as a contribution towards the reinstatement of the tramway track.

Glasgow.—SUBWAY CONVERSION.—The Transport Committee has recommended that the contract for the bogies and steel under-frames for the new electric coaches in connection with the conversion of the Glasgow Subway to electric power, plans for which have been approved by the Ministry of Transport, should be given to Messrs. Hurst, Nelson & Co., Motherwell. The station platforms, which are of wood at present, are to be constructed in concrete, to meet the requirements of the transport authorities.

Ipswich.—YEAR'S WORKING.—The Corporation trolley-bus undertaking made a surplus of £660 during the past year. The car miles amounted to 1,522,395 (an increase of 53,432), and 11,231,794 passengers were carried—a slight decrease.

TROLLEY-BUS SERVICE.—The Transport Committee is to extend the trolley-bus system to Chantrey Park at a cost of £2,500.

Newcastle-on-Tyne.—TROLLEY VEHICLES.—The Transport Committee is considering a proposal for the introduction of railless trolley vehicles in places where the renewal of the existing tram track may become necessary. It is believed that the Committee intends experimenting shortly with railless vehicles in Westgate Road.

Russia.—RAILWAY ELECTRIFICATION.—The 30-km. railway line betwen Leningrad and Oranien Caum has just been electrified at a cost of 20,000,000 roubles. During 1932 33½ million people were carried, and, as the time of the journey has been reduced from 58 to 30 minutes, it is hoped that over 40 millions will be carried next year.

South Africa.—DURBAN MUNICIPAL TRANSPORT.—Fifteen firms, all representing British manufacturers, have sent in tenders for the new municipal transport system at Durban. Although a proposal to use trolley-omnibuses was defeated at a Council meeting, it was decided to include these vehicles in the call for tenders, as an alternative form of transport. Tenders were invited for twenty-two trolley-omnibuses, nineteen petrol-omnibuses, and nine heavy-oil omnibuses. The prices quoted for trolley-omnibuses ranged from £2,128 to £3,157 per vehicle. Mr. J. A. Bromley, manager of the transport system, is at present in England.

Traffic Signals.—The Safety First Committee of the Newcastle City Council has approved in principle a scheme for

installing traffic signals on the Great North Road. The Windsor Corporation is to install traffic-actuated signals at Osborne Road (£500), and Middlesex County Council has installed automatic traffic signals at ten crossings on the Great West Road. The installation of traffic signals at the six cross-roads at the Bank, London, is under consideration. The density of the traffic here is estimated at 35,000 vehicles a day, and a serious hold-up affects traffic as far away as Trafalgar Square.

United States.—TROLLEY-BUSES.—As a part of a general street railway improvement programme costing $2,550,000, the Indianapolis Railways recently announced the purchase of eighty new railless trolley-cars, and fifty new street (tram) cars. Contracts signed with the J. G. Brill Co. and the General Electric Co., of New York, provide for early delivery. The new street cars will each be equipped with four General Electric motors and foot-operated control with field shunting, and air brakes with compressors. Each of the eighty trolley-coaches will be equipped with two General Electric motors.

A view of the Marconi short-wave beam transmitting equipment installed at the Kirkee station, near Poona, India

Communications

Australia.—INCREASE IN RADIO LICENCES.—Nearly half a million broadcast receiving licences are now in force in Australia. The total at the end of August was 491,233, which is an increase of about 80,000 since the beginning of the year. The numbers in each State are :—New South Wales, 185,864; Victoria, 178,721; South Australia, 52,682; Queensland, 38,097; West Australia, 22,599; Tasmania, 13,270. There were increases in all the States.

Bahamas.—TELEPHONY.—On November 2nd the long-distance telephone service was extended from Europe to the Bahamas. —*Reuter* (Nassau).

Canada.—NEW RADIO STATION.—The new 5,000-W broadcasting station of the Canadian Radio Commission was opened at Montreal on November 4th.

Great Britain.—RADIO RELAY SERVICES.—The Highways Committee of the Newport (I.o.W.) Corporation has refused Messrs. Sherratt & Son permission to establish a broadcast relay service.

The Rotherham Corporation Highways Committee has agreed to the assignment of the benefit of the existing agreement between Clear-Radio, Ltd., and the Corporation to a reconstructed company of the same name and the same objects but with increased capital, subject to the new company entering into similar covenants with the Corporation.

The Oldham Town Council has decided not to grant facilities for the establishment of relay services in the town.

The Mansfield Corporation Housing Committee has granted Notts and Derby Radio Relays, Ltd., permission to place overhead wires, &c., in approved places on the Corporation's various housing estates subject to the satisfaction of the borough surveyor.

India.—BEAM WIRELESS.—The accompanying illustration is a general view of the transmitter room in the Marconi short-wave beam transmitting station at Kirkee, near Poona, India. The panels represent, from left to right, the telegraph transmitter working to Great Britain, the telephone transmitter working to Great Britain, and the telegraph transmitter working to Japan. This station, which was originally opened in September, 1927, for the operation of a high-speed beam telegraph service with Great Britain, has recently been considerably enlarged and now also operates a telephone service with Great Britain and high-speed telegraph services with Japan. It is controlled by the Indian Radio and Cable Communications Co., Ltd.

Italy.—TELEPHONE ORDERS IN AMERICA.—The Società Italiana Reti Telefoniche Interurbane, an Italian company concerned with long-distance telephone systems, has just received an order from the Italian Government for a further extension of the Italian underground cable system and has placed orders for equipment with factories associated with the International Telephone and Telegraph Corporation to an amount exceeding $800,000. Italy now possesses one of the most complete underground long-distance telephone systems in the world, all the work having been executed by the Società Italiana Reti Telefoniche Interurbane during the past ten years.—*Reuter's Trade Service* (New York).

London.—RAILWAY RADIO.—Passengers in express trains on the London & North-Eastern Railway are not to have any more wireless entertainment for the present. The company has withdrawn the facilities as the result of a demand of the Performing Rights Society for copyright fees, but gramophone records are to continue to be used by agreement for a period of twelve months.

Radio Interference

IN Paris in June last a conference was held of representatives of a dozen organisations interested in the prevention of radio interference, under the auspices of the International Electrotechnical Commission. The desire in certain countries for some legislative action is fully realised, and in a few cases such action has already been taken. The Conference realised that any international action would have to be confined to purely technical matters, and that whatever regulations were issued by legislation in any country should, so far as possible, be based on a certain measure of agreement on the technical principles involved.

The International Electrotechnical Commission, basing itself on a number of suggestions which received a large measure of support at the Paris Conference, has constituted a special committee to deal with the matter, which will have as chairman the President of the I.E.C., Dr. A. F. Enström (Sweden), and will consist of seven experts appointed on the recommendation of the Electrotechnical Committees of each of the following countries: Germany, Great Britain, Holland, Denmark, France, Italy, Roumania, two representatives of the International Broadcasting Union, and one representative each of the International Union of Producers and Distributors of Electrical Energy, the International Conference on Large High-Tension Electric Systems, the International Union of Railways, the International Union of Tramways, and the International Commission on Aerial Navigation.

The British National Committee of the I.E.C. is to act as secretariat of the Special Committee on Interference, and the secretariat will be in the hands of the committee appointed by the Institution of Electrical Engineers under the chairmanship of Mr. C. C. Paterson.

The last-mentioned Committee recently held its second meeting. Since the last meeting four sub-committees have been engaged on the consideration of means which might be adopted and the cost of such means to render future plant and appliances non-interfering. Consideration has also been given to possible methods for dealing with interference apart from suppression at the source.

The reports of the sub-committees were considered in detail and accepted. The investigations have included such items as lifts, trolley-omnibuses, domestic appliances, and various other apparatus. The work of the sub-committees indicates that devices for the suppression of interference from many items of electrical plant, particularly domestic appliances, could be incorporated in future designs at a reasonable cost. Further investigation is necessary on some of the larger items of plant, and tests of a quantitative nature are being carried out by the British Electrical and Allied Industries Research Association on such items.

The Committee reviewed various possibilities of bringing suppression devices into general use without having recourse to legislation. It was emphasised that for the suppression of much of the electrical interference which exists at present, good will and co-operation will be necessary among a large number of interests. Pending the result of the further investigations which are now being carried out, it was agreed that co-operation should be sought with the manufacturers and other interests affected on the basis of the interim report of the sub-committees, and efforts are being centred in this direction. Consideration was also given to the possibility of international action on the question of electrical equipment embodying suppression devices, and arrangements were made for a British national committee to be set up to consider this question.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Argentina.—BUENOS AIRES.—November 27th. State Oilfields. 600-V cable and house-wiring material. (A.Y. 12059.)*

Australia.—MELBOURNE.—Post and Telegraph Department. November 21st. Telephone terminal strips. (A.Y. 11996.)* Lead-covered telephone cables. (A.Y. 12050.)*
November 28th. Lead-sheathed switchboard cables. (A.Y. 12002.)*
December 5th. Microphones. (A.Y. 12030.)* Telephone switchboard cable. (A.Y. 12015.)*
December 12th. Telephone parts and accessories. (A.Y. 12032.)* Telephone indicators. (A.Y. 12033.)* Multiple twin telephone cables. (A.Y. 12016.)*
December 19th. Telephone dial parts. (A.Y. 12031.)* Vitreous resistances. (A.Y. 12042.)*
January 2nd. Telephone switchboard lamps and sockets. (A.Y. 12053.)* Telephone jacks and number plates. (A.Y. 12066.)*
January 9th. Hand-operated telephone generators. (A.Y. 12064.)* Bells and buzzers. (A.Y. 12065.)*
State Electricity Commission of Victoria. December 4th. 22,000-V switchgear and accessories comprising oil circuit breaker equipments with current transformers. (A.Y. 12014.)*
January 8th. 115-kW a.c. motor. (A.Y. 12053.)*
January 15th. Triple braided copper conductor. A.Y. 12054.)*

Belgium.—BRUSSELS.—November 15th. Post and Telegraph Authorities, Salle de la Madeleine. Supply of two lots of armoured telephone cable with accessories. Particulars (Cahier des Charges Special No. 3701) for 16 fr.

Bridgend.—November 10th. Electricity Department. Stores for six months, including cables, meters, time switches, cookers, wash-boilers, &c. (October 27th.)

Egypt.—CAIRO.—Ministry of the Interior. November 30th. Six 50-kVA transformers. (A.Y. 12013.)*
November 14th. Pumps, electric motors, boilers, &c.

Fife.—County Council. November 14th. Various works, including electric lighting and heating installation and additions and alterations at Kirkcaldy West School. Schedules (deposit £1 1s.) from Mr. G. Sandilands, County Master of Works, Property and Works Department, Education Offices, Wemyssfield, Kirkcaldy.

Hastings.—December 2nd. Electricity Department. Supply of transformers for the year 1934. (See this issue.)

India.—NEW DELHI.—December 4th. Indian Stores Department. 220/230-V, single-phase, 50-cycle ceiling fans. (A.Y. 11959.)*
December 11th. D.c. ceiling fans. (A.Y. 11965.)*
January 8th. A.c. and d.c. table fans. (A.Y. 11967.)*
November 28th. Cotton- and silk-covered wire. (A.Y. 12044.)*

London.—ISLINGTON.—November 17th. Electricity and Lighting Committee. Supply of materials and labour in connection with the laying of distributor cables and earthenware pipes. (October 27th.)

New Zealand.—WELLINGTON.—Posts and Telegraph Department. December 5th. 2,400 lb. of cored solder. (G.Y. 13046.)*
January 16th, 1934. Public Works Department. Four 1,500-kVA transformers. (A.Y. 12017.)*
January 8th. Microtelephone cradles. (A.Y. 12046.)* Telephone jacks. (A.Y. 12045.)*
January 9th. A 100-Ah secondary battery with 60 cells. (A.Y. 12047.)*

Northern Ireland.—BELFAST.—November 22nd. Police Committee. Electrically illuminated traffic signs. (November 3rd.)

Seaton Delaval (NORTHUMBERLAND).—Urban District Council. Installation of electric lighting in forty-eight houses under construction. Plans, &c., by Mr. A. Dorin, surveyor.

South Africa.—KROONSTAD.—December 4th. Municipal Council. Machinery and plant for a power station. (A.Y. 12004.)* Steam raising plant. (G.Y. 13038.)* Motors, meters, cable, transformers, conductors, kiosks and other electrical items. (A.Y. 12029.)*
CAPE TOWN.—November 29th. Electricity Department. Fifty automatic street-lighting controllers. (A.Y. 11994.)*
November 18th. Electricity Supply Commission. One 1,500-kVA station oil-immersed transformer. (A.Y. 12041.)*
November 29th. 7,000 ironclad service cut-outs. (A.Y. 12051.)*
November 30th. H.p., l.p. and telephone cables. (A.Y. 12052.)*

Swansea.—December 4th. Corporation. Steam and feed water piping, valves, &c., for Tir John power station. (November 3rd.)

Uruguay.—MONTEVIDEO.—November 30th. State Electricity Supply and Telephones Administration. 101,400 metres of lead-covered conductors. (A.Y. 12012.)
November 29th. 233,000 metres of insulated conductors for outdoor use. (A.Y. 12011.)*

Warmley.—November 24th. Rural District Council. Materials and labour in connection with an extension of the Council's electricity mains. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Blackpool.—Transport Committee. Accepted. Mercury-arc rectifiers.—Bruce Peebles & Co., Ltd.

Ipswich.—Health Committee. Accepted. Electric vehicle battery (£210).—Chloride Electrical Storage Co., Ltd.
Estate Committee. Accepted. Electric lift at the Corn Exchange (£126).—Morris, Ltd.

London.—METROPOLITAN WATER BOARD.—Accepted. Electric pump (£236) and a water turbine pump (£378) for Kempton Park works.—Harland Engineering Co., Ltd. Electrically driven lathe for Brixton works (£192).—Denham's Engineering Co., Ltd.
L.C.C.—Central Public Health Committee. Accepted. Automatic telephone system, St. Alfege's Hospital, Greenwich (£1,587).—Buchanan & Curwen, Ltd.
Education Committee. Accepted. Electric lighting and power installation, Leigham Court Road School, Streatham (£403).—Buchanan & Curwen, Ltd.

Northumberland.—County Council. Accepted. Installation of internal telephones in the new Council offices under construction (£1,100).—Dictagraph Telephones, Ltd.

Rotherham.—Electricity Committee. Recommended. Cable (£4,716).—Metropolitan Cable and Construction Co., Ltd.

St. Albans.—Herts County Council. Accepted. Electrical work at Hill End Hospital extension (£2,926).—N. G. Bailey & Co.

Tynemouth.—Town Council. Accepted. Traffic signals.—J. H. Holmes & Co. (£274); Automatic Electric Co., Ltd. (£327).

Weymouth.—Town Council. Accepted. Installation of electric lighting in Council houses (£8 8s. 6d. per house).—Carter & Co.

Forthcoming Events

Birmingham Electric Club.—Friday, November 10th. Grand Hotel, Birmingham. 7 p.m. "Some Problems of a Works Engineer." Mr. F. C. Platt.

Junior Institution of Engineers.—Friday, November 10th. Institution, London. 7.30 p.m. Annual meeting. Friday, November 17th. 7.30 p.m. "Recording Sound for Motion Pictures." Mr. W. Harris.

Institution of Electrical Engineers.—Monday, November 13th. Institution, London. 7 p.m. Informal meeting. Discussion on "Power Factor Improvement." Opened by Mr. E. L. Fairclough. (*London Students' Section*).—Friday, November 10th. Institution, London. 6.15 p.m. "The Use of Electricity in Rural Areas." Mr. A. L. Cain. Saturday, November 18th. 6 p.m. Visit to *Daily Express* building, Fleet Street. (*North-Eastern Students' Section*).—Friday, November 10th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "Progress and Problems in Design." Mr. F. H. Williams. (*North-Eastern Centre*).—Monday, November 13th. Armstrong College, Newcastle-on-Tyne. 7 p.m. "The Low-Voltage Sections of the British 'Grid' System." Mr. C. W. Marshall. (*Scottish Centre*).—Tuesday, November 14th. Elmbank Crescent, Glasgow. 7.30 p.m. Mr. Marshall's paper. (*East Midland Sub-Centre*).—Tuesday, November 14th. The College, Loughborough. 6.45 p.m. "Some Recent Developments in the Art of Electrical Communication." Mr. J. Coxon. (*North Midland Students' Section*).—Tuesday, November 14th. Hotel Metropole, Leeds. 7.15 p.m. "Training for the Electrical Supply Industry." Mr. J. N. Waite. (*Sheffield Sub-Centre*).—Wednesday, November 15th. Royal Victoria Hotel, Sheffield. 7.30 p.m. Mr. Marshall's paper. (*Meter and Instrument Section*).—Wednesday, November 15th. Pagani's Restaurant, W.1. Section dinner.

Illuminating Engineering Society.—Tuesday, November 14th. Institution of Mechanical Engineers, London. 7 p.m. "The Development of Aviation Lighting." Major R. H. S. Mealing.

Institute of Industrial Administration.—Tuesday, November 14th. Institute of Hygiene, London. 6.30 p.m. "Engineering Economics in Relation to the Management Function." Mr. E. S. Byng.

Diesel Engine Users' Association.—Wednesday, November 15th. Caxton Hall, S.W. 3 p.m. Informal discussion on "The Examination, Testing and Maintenance of Air Containers for Diesel Engines."

Edinburgh Electrical Society.—Wednesday, November 15th. Philosophical Institution, Edinburgh. 8 p.m. "Induction Motor—Principles and Practice." Mr. H. V. Henniker.

Electrodepositors' Technical Society.—Wednesday, November 15th. Northampton Polytechnic Institute, E.C. 8.15 p.m. Autumn (annual) meeting. "Electrodeposition of Rhodium." Mr. R. H. Atkinson.

Royal Society of Arts.—Thursday, November 16th. John Street, Adelphi. 4.30 p.m. "The Application of Electricity to Agriculture and Horticulture." Mr. S. S. Nehru.

Institution of Mechanical Engineers.—Friday, November 17th. Institution, London. 6 p.m. "Heat Liberation and Transmission in Large Steam Generating Plants." Messrs. E. W. Robey and W. F. Harlow.

Overhead Lines Association.—Friday, November 17th. Harrods, Ltd., Knightsbridge. 8 p.m. Conversazione and supper-dance.

Physical Society.—Friday, November 17th. Imperial College of Science and Technology, S.W. 5 p.m. Presidential address. "The Measurement of Magnetic Field Distortion." Prof. A. O. Rankine.

Notes

The Electrical Association for Women

In October new branches of the Association were formed in Hove and Swindon; their formation indicates the rapidly increasing realisation by women in town and country of their need for more knowledge of the uses and benefits of electricity in the home. The Devon and Cornwall Counties Federation, and the Manchester and Salford District Branch recently held one-day conferences, at which "Rural Electrification" and "The Grid as it Affects the Housewife," were the subjects of discussions. Several posts in the electrical industry have recently been filled by E.A.W. nominees.

The October programme at headquarters included a special course in electrical housecraft for housewives and housekeepers, the continuation of the Monday evening meetings of the Demonstrators' Circle, and the beginning of the Thursday evening course for science and domestic science teachers, for which the lists had to be closed several days before the course started, and a number of applications were refused owing to lack of accommodation. The average attendance has so far been over eighty.

Birmingham's Electrical Progress

Mr. E. J. Jennings, secretary and general manager of the Birmingham Electric Supply Department, lecturing recently on "Birmingham's Electric Supply," referred to a criticism, made at a recent meeting of the Institution of Electrical Engineers in Birmingham, to the effect that electric lighting was developing rapidly everywhere except in Birmingham. He said he had been at some pains to get together the facts of the position in three typical cities in comparison

Mr. F. W. Martin greets Lord Meston at the E.I.B.A. dance at Witton, Birmingham (See note on page 662)

with Birmingham. The three acid tests were the number of consumers, the total quantity consumed in those areas, and the consumption of electricity per head of the population. He found that the number of consumers in Birmingham was 130,000, Manchester 88,000, Liverpool 91,000, and Glasgow 119,000. Incidentally, Birmingham had increased in a larger ratio than any of the others. With regard to the total quantity consumed, calculated in millions of kWh, Manchester's total was 409, Liverpool's 310, Glasgow's 234, and Birmingham's 434. As to consumption per head of the population, the amounts in kWh were: Manchester 388, Liverpool 307, Glasgow 288, and Birmingham 430. The average for the whole country was 203.

Lloyd's Register of Shipping

The annual report of Lloyd's for the year 1932-33 indicates that the reduction of the amount of world tonnage laid up can be accounted for by the increased number of old ships scrapped rather than by any general absorption into operation. However, plans passed for new orders show some increase. During the year steam turbo-electric ships increased by one to a total of forty-three, of 448,434 gross tons, while Diesel-electric ships remained at forty-eight of 117,184 gross tons. The 22,575-ton steam turbo-electric *Queen of Bermuda* was completed in February last, and two Diesel-electric tugs, the *Acklam Cross* and the *Lectro*, were completed quite recently, being the first to be built for use in this country. Exhaust steam installations are now under construction for six further vessels of the Ellerman fleet, the exhaust turbine driving a directly coupled generator which feeds a motor mounted on the main shafting.

The Society's rules for the application of electric arc welding to ship construction have been recognised by all interests concerned. The 1931-32 list of approved electrodes consisted of thirteen names, whereas in the corresponding list issued in July, 1933, particulars are given of forty electrodes which have been approved after undergoing expert examination and test by the Society's surveyors. Of these, twelve have successfully met the more stringent requirements for use in welding parts of primary importance in the structure of a vessel. During the year plans were approved for the construction of a welded barge, an all-welded tanker, and an all-welded vessel for general cargo-carrying purposes; while numerous proposals have been approved for the partial welding of vessels built to the Society's classification.

Faraday House Old Students' Dinner

The twenty-fifth annual dinner of the Faraday House Old Students' Association was held on November 3rd at the Savoy Hotel, W.C.; the president of the Association, Lord Rothes, was in the chair, and the number of those present exceeded three hundred. The toast of "Faraday House and its Old Students" was proposed by Mr. P. V. Hunter (president I.E.E.), who gave some reminiscences of his training at the college thirty-three years ago. He attributed the success of Faraday House to the personality of Dr. Alexander Russell, who had been there for forty years, during twenty-four of which he had been its principal. In response, Dr. Russell announced that in spite of trade depression 141 students had obtained posts from Faraday House during the past twelve months. Among the concerns in which old Faradians held responsible positions were Callender's (25), Reyrolle's (30), General Electric Co., Ltd. (20), North-Met. Co. (19), County of London Co. (17), Johnson & Philips (13), British Thomson-Houston Co. (12), Henley's (12), and the Central Electricity Board (11).

Major C. E. Prince, in proposing the toast of the guests, referred to the presence of the president, ten past presidents and three vice-presidents of the I.E.E. Four of the former were old Faradians, including Mr. P. V. Hunter. Brief replies were given by Sir Murdoch McDonald, M.P. (president Inst.C.E.), Mr. Allan E. L. Chorlton, M.P. (president I.Mech.E.), and Sir John Brooke (vice-president, Electricity Commission). Sir Murdoch McDonald said that he had no doubt that the grid would be of the greatest benefit to the country and a great factor in its future prosperity. The health of the chairman was proposed by Mr. G. W. Partridge.

The Mechanisation of Railway Goods Depôts

Experiments which are being made by the L.M.S. Railway at Burnley and Huddersfield represent, it is believed, the first instances in this country of the employment of slat conveyors for handling miscellaneous general goods traffic direct from rail wagons to road vehicles. The installation at Burnley (Bank Top) goods depôt consists of a slat conveyor 365 ft. long, operated by a 40-h.p. motor working at 400 V, in a continuous line between the wagon berths and the cart loading deck. Goods are conveyed from rail wagon direct to the lorry or rail transhipment wagon without intermediate trucking, the resultant benefits including increased speed of handling, earlier delivery of traffic to traders, and the avoidance of damage. The conveyors are reversible, and situated at deck level, so that in the event of breakdown the appliance forms part of the deck and does not obstruct ordinary hand-working operations.

Utilising the Heat of the Sea

Following upon the encouraging results of experiments in Cuba with the Claude-Boucherot process for the utilisation of sea heat, M. Georges Claude has informed the French Académie des Sciences that he proposes to continue his investigations by means of a floating equipment. The cargo vessel *Tunisie* (10,000 tons) is being fitted out by the Chantiers de France, Dunkirk, with a sea-heat power plant capable of developing a useful output of 1,800 kW, of which 1,200 kW will be applied to the manufacture of ice.

The number of coastal sites technically suitable for the operation of sea-heat stations is very limited, and most of these have no easily accessible market for large quantities of power. A ship station, on the other hand, can anchor at any convenient spot in tropical waters reasonably near a populated district. The vertical cold water pipe is much cheaper and more efficient than that from even a favourably situated coastal station. Transmission of electrical energy from ship to shore is impracticable, at least for the present, but the manufacture of ice is considered to offer a convenient and profitable means of utilising and storing the energy developed. The low-temperature water available from the depths of the sea increases the efficiency of the refrigerating plant, and M. Claude estimates that bulk supplies of ice in tropical regions can thus be obtained at less than one-fifth of the present cost.

The Benevolent Ball

Captain Keeping, the hon. secretary of the Electrical Industries Benevolent Association, asks those who wish to book tables for parties at the Ball on November 23rd (Grosvenor House) to communicate with him early. A full attendance is in prospect. Sir W. Ray, M.P., will be present.

Appointment Vacant

Deputy electrical engineer for Hammersmith Electricity Department. (See our classified advertisements.)

Makers' Names Wanted

MUNDLOS electric sewing machine.
T.R. perforating machine for lamp shades.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. A. C. Allum, of the Allum Electrical Co., Ltd., Auckland, N.Z., and chairman of the Auckland Transport Board is in this country on official business. Communications should be addressed to him c/o the New Zealand High Commissioner, Strand, W.C., or at the Waldorf Hotel, Aldwych, W.C. Mr. Allum expects to return to New Zealand at the end of this month.

Professor E. V. Appleton has been awarded the Hughes Medal by the Royal Society for his researches into the effect of the Heaviside layer upon radio transmission.

Mr. G. W. Preston

Mr. G. W. Preston, A.M.I.E.E., has been appointed electrical engineer to the recently formed Copper Development Association, Thames House, Millbank, S.W.1. Most of the important copper producers, manufacturers, and trade associations are members of the Association, which aims at promoting increased utilisation of copper and copper-containing materials. Mr. Preston received his technical training at Faraday House, and was for a number of years connected with Callender's Cable & Construction Co., Ltd. He has more recently been associated with the British Power & Light Corporation, Ltd. A note upon the personnel of the Association appears on page 672.

Dr. D. H. Ingall has been appointed principal of the Borough Polytechnic, in succession to **Mr. J. W. Bispham,** O.B.E., M.A., B.Sc., who has been promoted to Assistant Education Officer (Technology) under the London County Council. Dr. Ingall received his training at King Edward's High School, Birmingham, and the University of Birmingham. From 1913 to 1915 he was metallurgist to the Patent Shaft & Axletree Co., Ltd., returning to that company in 1919. Towards the end of that year, however, he was appointed senior lecturer in the Department of Metallurgy in the University of Birmingham, where he remained until 1921, when he became principal and head of the Department of Metallurgy at the Staffordshire County Technical College, Wednesbury. In 1931 he was appointed assistant director and research manager of the British Non-Ferrous Metals Research Association. Dr. Ingall, who is a D.Sc. (University of Birmingham), is a member of the Iron and Steel Institute, the Institute of Metals, and a Fellow of the Institutes of Physics and Chemistry.

Mr. W. Sandle, who for many years has been in charge of the maintenance of the Rotherham Electricity Department's steam engines and turbines, attained the age of sixty-five on November 1st, and has retired under the Corporation superannuation scheme. The Corporation, at its meeting on October 30th, approved a recommendation of the Electricity Committee instructing the Town Clerk to send a letter of appreciation to Mr. Sandle for the valuable services rendered by him to the Department. On October 31st, before a large gathering of staff and workmen, Mr. Sandle was presented with a canteen of cutlery and a pair of prismatic binoculars. In making the presentation on behalf of the staff and workmen, Mr. W. H. Duffett, the borough electrical engineer, said that Mr. Sandle was the first member of the staff to retire under the superannuation scheme. Mr. Sandle joined the Department from W. H. Allen, Sons & Co., Ltd., in June, 1905, as mechanical engineer in charge of the Department's engines, which were driving generators of a total capacity of 1,208 kW. Now the plant capacity was 70,500 kW. He hoped that Mr. Sandle and Mrs. Sandle would have good health and long life to enjoy the fruits of their well-earned rest.

Mr. W. Sandle

Mr. H. E. Ferguson, who for many years has been secretary to the Clyde Valley Electrical Power Co., has been appointed general manager in succession to Mr. E. T. Goslin, who retired last year. Mr. Ferguson has been in the service of the company for over twenty-seven years, and has held the position of secretary for twenty-two years. He received his training with Messrs. Mackie & Clark, chartered accountants, Glasgow, and held several appointments with engineering concerns before joining the Clyde Valley Co. Since the retirement of Mr. Goslin he has acted as general manager.

[Weir Bros., Glasgow

Mr. H. E. Ferguson

Mr. A. Miller, who succeeds Mr. Ferguson as secretary of the Clyde Valley Co., has a long record of service with the company, and has for some time been accounts controller.

At a meeting of Barnstaple Town Council on October 30th it was decided to make no alteration at present in the salaries of the officials of the Electricity Department with the exception of the shift charge engineer. Increases had been recommended by the Electricity Committee but disapproved by the Finance Committee, and Mr. G. Garnish, chairman of the Electricity Committee, in submitting his recommendations, pointed out that the proposed adjustment of the salary of **Mr. J. Hadfield,** the borough electrical engineer, was in accordance with the salaries standardised by the I.M.E.A., while the proposed increases in salaries of other members of the staff, including assistant engineers, shift engineers, &c., were based on the scale agreed by the National Joint Board of Employers and Members of Staff. In the discussion which followed it was contended that if the increases were granted, officials of other departments would be dissatisfied.

Councillor F. Hewson, chairman of the St. Pancras Borough Council Electricity Committee, who was elected Mayor of the Borough yesterday, has taken particular interest in the electrically equipped flats described in this issue

Mr. C. Furness, who is electrical engineer and transport manager to the Blackpool Corporation, has been elected an honorary member of the Municipal Tramways Association in recognition of his long and distinguished service. Mr. Furness has been a member of the Association for twenty-three years, and was president last year.

[Elliott & Fry

Mr. C. Furness

Mr. Fred Parsons, accountant of the Johannesburg Electricity Department, has retired on pension, and his colleagues in the municipal service have presented him with a wallet of notes. Mr. Parsons is a native of London and went to South Africa with the City Imperial Volunteers during the South African war.

Coun. F. H. Morecroft, who is in business in High Street, Dover, as an electrical and radio engineer, has been elected Mayor of Dover for the second

successive year. He has been a member of the Corporation for eleven years.

Mr. Christopher S. Davy, chief engineer of Messrs. Babcock & Wilcox, Ltd., has been appointed to the board of the company.

Mr. R. G. Rawkins, director, manager and secretary of the Notting Hill Electric Lighting Co., Ltd., was presented with a silver salver by members and ex-members of the London Electricity Supply Association at a dinner given in his honour on October 31st. Further reference to the function appears on page 673 of this issue.

Mr. T. G. Leigh, manager of the Household Appliance Department of the G.E.C., has found it necessary to resign owing to ill-health. In future the department will be divided into two sections, *i.e.*, a cooking department, which will be managed by **Mr. D. W. G. Acworth,** and a household appliance department, which will be in the charge of **Mr. C. R. Duncombe.**

Mr. J. L. Van Os, a director of the Dominion Electrical Co., has returned from America. He has taken an interest in manufacturing certain patent lighting devices in Canada for export to this country.

Mr. R. E. Bassett has resigned his position as senior assistant electrical engineer with the North-Eastern Electric Supply Co., Ltd., after nineteen years' service. We are informed that he is taking up a partnership in an electrical business in South-West England.

Obituary

Dr. F. J. Waldo.—We regret to record the death of Dr. Frederick Joseph Waldo, M.A., M.D. (Cantab), Barrister-at-Law of the Middle Temple, which occurred, at the age of eighty-one years, at 40, Lansdowne Road, Holland Park, W.11, on November 2nd. Dr. Waldo's name has a place in the ELECTRICAL REVIEW for special reasons. As Coroner for the City of London and Borough of Southwark, it fell within his authority to hold inquiries in these important areas into the causes of many fires. He was particularly searching in investigating suggestions, suspicions, or actual charges, that electricity was the cause of these outbreaks. He was a frequent correspondent of the ELECTRICAL REVIEW on matters of this nature, both for publication and in private co-operation with the Editors, and it is only fitting that tribute should be paid in these pages to the memory of one who was zealously impartial in his efforts to get at the truth when the safety or otherwise of electrical installation work was in question.

Monsieur H. de la Paulle.—The death recently occurred in Brussels, at the age of sixty-six, of Monsieur Hubert de la Paulle, the president of the Société Belge des Electriciens. He was educated at Ghent University; in 1893 he secured his engineer-electrician diploma at the Institut Montefiore, and at the age of twenty-seven became associated with the Compagnie Continentale du Gaz, a concern which, despite its name, has many electrical associations, later becoming its general manager, and, finally, general director. M. de la Paulle had been suffering from bad health for some time, but practically up to the day of his death he had been busying himself with the details of the celebration in February next of the jubilee of the Société Belge des Electriciens, at the conclusion of which he had resolved to retire from business. As a token of respect, the Société has resolved to postpone the celebrations.

Mr. James S. Bell, electrical engineer, died suddenly, on November 5th, at his residence in Aberdeen, in his fifty-first year. After serving his apprenticeship as an electrical engineer he was for seventeen years in the employment of Messrs. F. C. Smith & Co. Later, he started on his own account, and built up a successful business in the Aberdeen district.

Mr. J. H. Kloet.—The death occurred on October 28th of Mr. James Herbert Kloet, of Heaton Chapel, near Stockport. Since 1912 he had been managing director of the Commercial Electric Co., Ltd., of King Street West, Manchester.

Mr. Ll. T. Jones, M.B.E., Commander, Eastern Telegraph Co. (retired), died on November 1st, at the age of fifty-five years, at a London nursing home.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Irish Refrigeration Co., Ltd.—Private company. Registered in Dublin October 26th. Capital, £10,000 in £1 shares. Objects: To acquire the business of manufacturers' agents hitherto carried on by Oswald and H. Jamison (Dublin), Ltd., to carry on the business of mechanical and electrical engineers, electricians, machinists, agents for the sale of machinery and equipment of all kinds, manufacturers and repairers of and dealers in refrigerators, &c. The directors are: O. Jamison, 84, Middle Abbey Street, Dublin; H. Jamison, 33, Wellington Place, Belfast; and Jean Jamison, "Glanmire," Bray, Co. Wicklow. Secretary: T. Coyne, 84, Middle Abbey Street, Dublin.

W. O. Knell, Ltd.—Private company. Registered November 1st. Capital, £500 in £1 shares. Objects: To carry on the business of electrical and radio engineers, dealers in electrical and radio products, &c. The directors are: W. White, 18, East Street, Bridport; and W. O. Knell, 5, St. Alban Street, Weymouth. Secretary: C. Buckley. Registered office: 18, East Street, Bridport.

L. Clarke & Co., Ltd.—Private company. Registered October 30th. Capital, £1,000 in £1 shares (800 8 per cent. cumulative and participating preferred ordinary and 200 deferred ordinary). Objects: To carry on the business of welders and fabricators of articles used in all trades, manufacturers of and dealers in all kinds of machines and apparatus used in the electrical and allied trades, engineers, founders, coppersmiths, &c. The directors are: L. Clarke, engineer (chairman), and Mrs. Ella A. Clarke, both of 82, Argyle Road, Ealing, W.13. Secretary: C. A. Barham.

Thorne's Radio & Battery Service, Ltd.—Private company. Registered November 3rd. Capital, £500 in 10s. shares. Objects: To carry on the business of manufacturers and repairers of, agents for and dealers in wireless sets, components and apparatus, electrical fittings and appliances, gramophones, &c. The subscribers are: G. Thorne, Oakley House, Northway, Bishopston; and G. Thomas, 23, Union Street, Swansea. Secretary: G. Thorne. Registered office: Oakley House, Bishopston, Glam.

Clifford Lister, Ltd.—Private company. Registered November 4th. Capital, £1,500 in £1 shares. Objects: To carry on the business of radio, electrical, lighting, telephone and general engineers, &c. The permanent directors are: C. Lister and Mrs. M. Lister, both of 34, Brookvale Road, Southampton.

D.C. Electric Co., Ltd.—Private company. Registered November 4th. Capital, £3,000 in £1 shares (1,500 6 per cent. preference and 1,500 ordinary). Objects: To acquire the business of an electrical and mechanical engineer, carried on by J. Dootson, at Sherborne, Dorset, as the "D.C. Electrical Co." The subscribers are: J. Dootson, Sherborne, Dorset, and B. Lakeman, 4, Sheldon Avenue, Chester. Secretary: J. Dootson. Registered office: Cheap Street, Sherborne.

Slough Electrical Co., Ltd.—Private company. Registered November 4th. Capital, £500 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers, manufacturers and workers of electricity, motive power and light, manufacturers of and dealers in radio instruments, &c. The first directors are: W. J. Thompson and Mrs. F. R. Thompson, both of 3, Broad Oak Estate, Farnham Road, Slough. Secretary: W. J. Thompson, Junr. Registered office: 3, Broad Oak Estate, Farnham Road, Slough.

Neon Luminations, Ltd.—Private company. Registered November 4th. Capital, £2,000 in £1 shares. Objects: To carry on the business of electrical engineers and general electrical installation contractors, steel makers and convertors, sign makers, &c. The subscribers are: G. S. Shaw, 27, Knowsley Road, Wallasey, Ches., and E. W. Jones, 78, Cambridge Road, Seaforth, Lancs. Secretary (pro tem): G. S. Shaw. Solicitors: Campbell & Co., 67, Dale Street, Liverpool.

Ultrex Radio, Ltd.—Private company. Registered November 4th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical and wireless apparatus and musical instruments, &c. The subscribers are: A. Hyams, 54, Atherfold Road, Clapham, S.W., and F. H. Hulatt, 48, Ipsden Buildings, Lambeth, S.E.1. Registered office: 25, York Terrace, Clapham, S.W.4.

Harry F. Platt & Co., Ltd.—Private company. Registered November 4th. Capital, £1,500 in £1 shares. Objects: To carry on the business of engineers' and general agents, merchants and contractors, consulting, inspecting, electrical, mechanical and radio engineers, manufacturers and workers of electricity, &c. The permanent directors are: W. D. Bell, Craigview, Prestwick, Ayrshire (director of Andrew Barclay, Sons & Co., Ltd.), and H. F. Platt, The Knoll, 23, Barn Rise, Wembley Park. Registered office: 78, Victoria Street, S.W.1.

Keen Production Co., Ltd.—Private company. Registered Nov. 2nd. Capital, £5,000 in £1 shares (1,000 15 per cent. participating preference and 4,000 ordinary). Objects: To carry on the business of electrical engineers, manufacturers and repairers of and dealers in accumulators, batteries, acids and containers, dynamos, motors, transformers, magnetos, and electrical plant, &c. The permanent directors are: A. R. Clarke, 164, Elgar Avenue, Tolworth, Surrey, and H. McIntyre, 22, Clarence Street, Kingston-on-Thames. Registered office: Keen Works, Coombe Road, New Malden, Surrey.

Truphonic Radio (Putney), Ltd.—Private company. Registered November 2nd. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in electrical and wireless apparatus of all kinds, gramophones, radio-gramophones, &c. The directors are: S. H. Hester and J. S. C. Hester, both of Southlawn, Hawthorne Road, Bickley, Kent. Registered office: 50, Cannon Street, E.C.4.

Horsham Relay Service, Ltd.—Private company. Registered November 2nd. Capital, £1,000 in £1 shares. Objects: To construct and maintain stations, exchanges and lines for the reception or distribution of radio signals; to receive, transmit, relay or conduct wireless or radio signals and programmes, &c. The directors are: Lt.-Col. W. C. Hale, 19, Moorgate, E.C.2, and A. R. Hunt, address not stated. Solicitors: Deacon & Co., 29, Great St. Helens, E.C.

Returns of Electrical Companies

J. M. Fenn, Ltd.—Particulars filed of debentures for not more than £1,000 authorised October 16th, 1933, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £1,000.

Lewtas's, Ltd.—Particulars filed of £1,000 debentures authorised October 3rd, 1933, charged on the company's undertaking and property, including uncalled capital, the whole amount being now issued.

Downton & Ivey, Ltd.—Particulars filed of £500 debentures authorised October 12th, 1933, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount now issued.

Phillips, Brown (Manchester), Ltd.—The nominal capital has been increased by the addition of £2,000 beyond the registered capital of £3,000. The additional capital is divided into 2,000 7½ per cent. cumulative preference shares of £1 each.

Rheostatic Co., Ltd.—The nominal capital has been increased by the addition of £25,000 beyond the registered capital of £25,000. The additional capital is divided into 10,000 6 per cent. cumulative preference and 15,000 ordinary shares of £1 each.

Bond Wholesale Electrical Co., Ltd.—P. F. Muggison, 33, Friar Lane, Leicester, ceased to act as receiver and/or manager on August 28th, 1933.

General Cable Manufacturing Co., Ltd.—Satisfaction to the extent of £875 on October 16th, 1933, of a series of debentures authorised by resolution dated April 12th, 1933, and registered April 26th, 1933.

Anglo-Portuguese Telephone Co., Ltd.—Satisfaction in full on September 11th, 1933, of trust deed dated February 1st, 1927, and supplemental trust deeds dated October 19th, 1927, May 1st, 1928, and February 9th, 1932, and registered February 7th, 1927, October 24th, 1927, May 16th, 1928, and February 18th, 1932, respectively.

Waste Heat & Gas Electrical Generating Stations, Ltd.—Capital, £350,000 in £1 shares. Return dated April 4th, 1933. 320,000 shares taken up. £320,000 paid. Mortgages and charges, nil.

Macintosh Cable Co., Ltd.—Capital, £250,000 in £1 shares. Return dated April 4th, 1933. 200,000 shares taken up. £13,004 paid. £186,996 considered as paid. Mortgages and charges, nil.

Boston and District Electric Supply Co., Ltd.—Capital, £120,000 in £1 shares. Return dated June 15th, 1933. All shares taken up. £120,000 paid. Mortgages and charges, nil.

Lincoln Radio Relay Service, Ltd.—Issue on October 13th, 1933, of £300 debentures, part of a series already registered.

Community Radio (1928), Ltd.—Particulars filed of £1,500 debentures, authorised by resolutions of October 17th and October 19th, 1933, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £200.

West Devon Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £40,000 beyond the registered capital of £210,000. The additional capital is divided into 28,000 non-redeemable preference and 12,000 ordinary shares of £1 each, ranking *pari passu* with existing shares.

Landis & Gyr, Ltd.—The nominal capital has been increased by the addition of £40,000 in £1 shares beyond the registered capital of £40,000.

Yorkshire (Woollen District) Electric Tramways, Ltd.—Capital, £500,000 in 250,000 preference and 250,000 ordinary shares of £1. Return dated June 6th, 1933. 220,000 ordinary shares taken up. £220,000 paid. Mortgages and charges, nil.

Premier Accumulator Co. (1921), Ltd.—Capital, £40,000 in £1 shares. Return dated September 1st, 1933. All shares taken up. £18,749 paid (£1 per share on 11,249 and 15s. per share on 10,000 shares). £18,751 considered as paid on 18,751 shares. Mortgages and charges, nil.

Asea Electric, Ltd.—Capital, £5,000 in £1 shares. Return dated September 22nd, 1933. All shares taken up. £5,000 paid. Mortgages and charges, nil.

City Notes

The Telsen Electric Co., Ltd., reports a loss for the year ended June 30th last of £55,958, as compared with a trading profit of £190,664 for the previous period of thirteen months, when a dividend of 50 per cent. was paid. The directors attribute the loss to the failure of an all-electric set which the company placed upon the market in the autumn of last year. They estimate that upon this set the company has lost far more than the whole of the loss shown in the accounts. The depression in the radio industry caused the cancellation of a large number of contracts which the company had taken for the sale of its products. Mr. W. Henderson-Cleland and Mr. A. A. Rowse were elected to the board in September last. These gentlemen felt they could not accept responsibility for the past year's trading results, and accordingly resigned. They have expressed their agreement to join the board as financial advisor and technical assistant respectively provided arrangements satisfactory to them can be made for financing the business in the future. These arrangements, the report states, have been made, and at the meeting to be held on November 14th Messrs. Henderson-Cleland and Rowse will be proposed as additional directors.

The Amazon Telegraph Co., Ltd., reports a profit for the year ended June 30th last of £13,286, as compared with £6,344 in 1931-32, which with £6,149 brought in makes £19,435 available. It is proposed to pay a dividend of 5 per cent. and to carry forward £10,060. The report states that although the company's concession from the Brazilian Government does not expire until 1945, the subsidy ceases in April, 1935, and with the severe competition of the Government wireless service, it will not be possible for the company to carry on after that date unless some suitable revision of the contract with the Government can be arranged. Failing that, a substantial loss of capital will be inevitable, as it will be impossible for the company, during the short time remaining, to make further provision for the writing off of its capital expenditure on fixed assets. Every effort is being made to obtain some revision of the contract on terms sufficiently favourable to justify the company carrying on its business.

Johnson & Phillips, Ltd., have decided not to pay an interim dividend at present. The directors recall that to enable the dividend of 5 per cent. for 1932 to be paid, £10,000 was transferred from the dividend equalisation fund. They consider that this fund should be made up to the original amount before any interim payment is made. Business is reported to be slightly better than last year, but prices are still low and competition is keen. The company is actively engaged on the work involved in the supply of electricity to the Westmorland area, and has recently completed the h.p. distribution system in the Isle of Man. The existing undertakings in the Dunoon and Ringmer districts are progressing satisfactorily, and extensions to these undertakings are constantly being made.

Hall Telephone Accessories (1928), Ltd., is offering shareholders 25,200 10s. shares at 15s. each, in the proportion of one new share for every fifteen held. The directors state that opportunities have arisen of coupling with the company's specialised products other manufactures of a more competitive nature. Extensions to the factory at Willesden are to be made at an estimated cost of £18,000.

Edmundson's Electricity Corporation, Ltd., reports that during October the electrical energy generated and purchased totalled 44,758,000 kWh. as compared with 36,756,000 kWh in the corresponding month of 1932, an increase of 22 per cent. The total for the first ten months of the current year was 378,820,000 kWh. against 315,702,000 kWh in the corresponding period of 1932, an increase of 20 per cent.

Ruths International Accumulators, Ltd.—At an extraordinary general meeting, which followed the annual meeting on October 31st, resolutions were passed reducing the capital from £500,000 to £180,703 5s. by extinguishing 21,000 shares of 10s. each and by cancelling capital to the extent of 6s. 9d. per share and repaying capital to the extent of 9d. per share on the remaining issued shares of 10s. each. Further resolutions were passed providing for the sub-division of the existing unissued shares into shares of 2s. 6d., and for reinstating the capital of £500,000.

The Craigpark Electric Cable Co., Ltd., has announced the usual half-yearly payment on the preference shares, but has deferred consideration of an ordinary dividend until the accounts for the year ended March 31st, 1934, are available. Last year an interim ordinary dividend of 4 per cent. was paid, followed by a final distribution of 2 per cent.

The City of Buenos Ayres Tramways Co. (1904), Ltd., has declared a dividend of 1s. 3d. per share (being at the rate of 5 per cent. per annum), less tax, for the quarter ended September 30th.

The Chloride Electrical Storage Co., Ltd., has declared an interim dividend on the "A" and "B" ordinary shares of 5 per cent., less tax (against 6 per cent.).

The Cawnpore Electric Supply Corporation, Ltd., has announced an interim dividend of 3 per cent. on the ordinary shares (unchanged).

Ericsson Telephones, Ltd., has announced an interim ordinary dividend of 6 per cent. No interim dividend was declared a year ago, but the final distribution was 12 per cent.

The Anglo-Portuguese Telephone Co., Ltd., has declared an interim dividend of 3 per cent. on the ordinary shares (same).

Stocks and Shares

TUESDAY EVENING.

THE present-day stream of new issues shows no indication of failing. Purely gilt-edged stocks, and a number of industrial securities, are being offered to a public which continues to exhibit a lively readiness to absorb whatever sound stock is available. This stock must not be too dear, however, if it is to secure prompt subscription. Manchester offered a loan of 3 per cents. at 95 last week, and the underwriters were left with about 50 per cent. of their obligations. The point is worth mentioning for the guidance of prospective borrowers who may be inclined to think that, in the present temper of the investor, they will be able to secure practically what price they please.

Electricity Authorities

The only alteration in Central Electricity stocks is the quotation ex dividend of the 3½ per cent. stock of 1962-1993. At 92¼, the stock begins to look reasonably priced, in that it pays 3¾ per cent. outright, and a few pence more allowing for redemption at the later of the two dates mentioned. The stock can be bought at present free of stamp and fee, whereas the other stocks of the Central Electricity Board, namely the 5 per cents. and the 4½ per cents., are subject to the heavy 1 per cent. transfer stamp. The yield on them all is virtually the same; the 5 per cent. of 1955-95, allowing for redemption, pays £3 16s. 6d. per cent. As previously mentioned, the yields calculated in our price tables do not make allowance for redemption of the stocks. The 5 per cent. stocks of the North West Midlands Joint Electricity Authority and the West Midlands Joint Electricity Authority have both advanced to 114.

London Transports

London Passenger Transport "A" and "B" stocks are scarce. There has been, however, a further fall in Transport

"C," lowering the quotation to 81 as against 86 a fortnight ago. The decline is due to an impression that the Board may elect to pay no interim dividend next spring, but to defer consideration of any payment until the end of the year. Some of the recent buyers of the stock argue that the latter is too long a time for them to wait before they obtain information as to what the stock will receive in the shape of dividends for the first year of its existence. At anything like 80, London Transport "C" stock will attract the attention of the speculative investor to whom present dividends are of less consequence than security of capital, and of probable ultimate appreciation in the value of his stock.

Electricity Supply Shares

Brompton ordinary have improved to 34s., and South London ordinary to the same price. This may be taken as approximately the present-day value of the ordinary shares in all the London electricity supply companies that are governed by the special Act. Chelseas hardened to 33s. 6d. Westminsters, which for a long time stood below the level of the other London shares, have come into line at 34s. County of London are governed by a different set of conditions, and these affect the dividend of the company, which, instead of being the regular 7 per cent., is 10½ per cent., giving a yield, at the present price of 56s. 3d., of £3 14s. 8d. per cent. on the money. At 34s., the 7 per cent. standard rate of dividend affords £4 2s. 4d. per cent. on the money.

In the provincial group, West Gloucestershire ordinary retains its improvement to 69. The Scottish group is unchanged. Edmundson's are steady at 37s. 9d. In North Metropolitans there is a good deal of trade passing, without its having influenced the price to any particular extent, the shares being still quoted at 60s. 6d. Southern Areas at 25s. have recovered 1s. North Eastern ordinary are better at 34s., and Isle of Thanets improved to 31s. 3d.

Cables and Wireless

The market in Cables & Wireless issues continues to be dull. As previously indicated here, public interest in the stocks has ebbed of late. The speculative attraction of the group is overshadowed by activity in stocks and shares, which, for the time being, are more popular. To galvanise the market a material improvement must occur in the ratio of earnings; until this becomes apparent, the stocks are likely to loiter. American Telephone & Telegraph shares have fallen another 2 points to 117¼, on apprehensions current in Wall Street as to the probability of the 9 per cent. dividend being maintained. Internationals have remained about 12½. Western Unions, in sympathy with most of the other dollar stocks, have gone back to 50.

A.E.C.

Associated Equipment Company shares came down with a run to 30s., upon publication of the company's statement, the advertisement of which is a necessary preliminary to permission being sought from the Stock Exchange Committee for leave to deal in the shares. It is understood that the way is now open for a settlement to take place very shortly, and announcement of the company's figures caused no little disappointment to people who had bought the shares at prices ranging from 32s. to 38s. 6d. The statement issued last week shows that the interim dividend for this year was no more than 2 per cent. less tax, against 2½ per cent. tax free six months ago, and this is considered tantamount to an intimation that the dividend for the current twelve months will be less than the 7½ per cent. tax free distributed for last year. It must be admitted that the previous buyers had some ground for surprise in the official table now advertised.

Telsen's Loss

The price of Telsen Electric Company ordinary shares has fallen to 14s. upon publication of accounts to the 30th June last, showing a loss of £55,958, this latter comparing with a profit of £190,000 in the previous thirteen months, when, it will be recalled, a dividend of 50 per cent. was paid on the £1 shares. Of these latter 60,000 were offered for sale in May last year at £3. The price rose to 3¼. At the end of March this year it was down to a guinea. The chief cause of the loss just announced is stated to be the failure of an all-electric set. The board estimates that upon this set the company lost far more than the whole of the loss shown by the accounts. The meeting will take place at Birmingham on Tuesday in next week, November 14th.

Manufacturing and Equipment

In the market for shares in manufacturing and equipment companies, the changes are of little consequence. Enfield Rolling Mills are not quite so active as they have been recently, and the price is a shade easier at 28s. 6d. Electrical and Musical Industries ordinary are dull at 15s. 6d., as a sequel to the issue of the recent report. Hall's Telephone Accessories are quoted ex rights to the new issue of shares. The old shares are 19s. middle, and the new, which came out at 15s., are 4s. premium. The rubber share market is quiet, though the price of the product, at 4d. per lb. for cash, shows a trifling improvement. The iron and steel market is firm, trade reports from various parts of the country indicating that industry maintains its progressive character, while announcement of a further reduction in the number of unemployed lends official colour to the view.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Approx. Dividend. 1931.	1932.	Price, Nov. 7.	Rise or Fall.	Yield. p.c. £ s. d.
Bournemouth and Poole	1	15	15	78/9	—	3 16 0
Brompton Ordinary	1	8½	7	34/-	+1/-	4 2 4
Charing Cross Ordinary	1	8½	7	34/6	—	4 1 2
Chelsea	1	8¾	7	33/6	+1/-	4 3 7
City of London	1	10	10	33/9	—	4 3 0
Clyde Valley	1	7	7	40/-	+6d.	3 10 0
County of London	1	10½	10½	56/3	—	3 14 8
Edmundson's 7% Pref.	1	7	7	34/-	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	47/6	—	3 15 9
Elec. Supply Corporation	1	11	11	80/-	—	2 15 0
Kensington Ordinary	1	8	7	34/-	—	4 2 4
Lancs Light and Power	1	7	7	36/3	—	3 17 2
London Electric	1	9	7	34/-	—	4 2 4
Metropolitan	1	10	10	52/6	—	3 16 0
Midland Counties	1	7	7	37/-	—	3 15 8
Mid. Elec. Power	1	8	8	45/-	—	3 11 1
North Eastern Electric Ordinary	1	6	6	34/-	+1/-	3 10 8
Do. 7% Pref.	1	7	7	34/6	+6d.	4 1 2
Northampton	1	10	10	55/-	—	3 12 9
Notting Hill 6% Pref.	10	6	6	13¾	—	4 8 11
North Met. Elec. 6% Pref.	1	6	6	30/-	—	4 0 0
St. James' and Pall Mall	1	8	7	34/-	—	4 2 4
Scottish Power	1	8	8	38/9	—	4 2 6
South London	1	8½	7	34/-	+6d.	4 2 4
Westminster Ordinary	1	8¼	7	34/-	—	4 2 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/9	—	7 4 7
Yorkshire Elec.	1	8	8	46/3	—	3 9 3

Public Boards.

Central Electricity, 1950–70	Stock	5	5	114	—	4 7 6
Do. 1951–73	,,	4½	4½	109½	—	4 2 2
Do. 1963–93	,,	—	3½	92¼xd.	—	3 15 10
London & Home Counties 1955–75	,,	4½	4½	110	—	4 1 10
London Passenger Transport, A	,,	—	4½	117	—	3 17 0
Do. do. B	,,	—	5	121	—	4 2 8
Do. do. C	,,	—	—	81	—1	—

Telegraph and Telephones.

American Tel. & Tel.	$100	9	9	117½	—2	7 13 3
Anglo-Am. Tel. Pref.	Stock	6	6	114½	—	5 4 10
Do. Def.	,,	1½	1½	29½	—	5 1 8
Cables & Wireless 5½% Pref.	,,	2¾	2¾	74½	—1	3 13 11
Do. A 7½% Ord.	,,	Nil	Nil	25½	—	—
Do. B Ord.	,,	Nil	Nil	11	—1	—
Globe Tel. and T. Ord.	10	Nil	2½	10½	—	2 7 9
Do. do. Pref.	10	6	6	12½	—	4 16 0
Great Northern Tel.	10	20	20	32½	—	6 3 0
Marconi-Marine	1	10	7½	28/9	—	5 9 1
Oriental Telephone Ord.	1	12	12	2⅛	—	*4 1 6

Home and Foreign Trams, Etc.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	3/3	←	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—1½	—
British Electric Traction Df. Ord.	,,	5	5	490	—	—
Do. do. Pref. Ord.	,,	8	8	144½	—	5 10 9
Brazil Traction	100	—	—	13¾	—	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	103	—	4 17 0
Mexico Trams, 5% Bonds	—	5	5	31½	—	15 16 4
Mexican Light Common	100	Nil	Nil	7½	—	—
Do. 7% Pref.	100	7	7	11	—	—
Do. 1st Bonds	—	5	5	45	—	11 2 8
Victoria Falls Ord.	1	15	20	5⅞	—1/8	3 17 3
Yorkshire (West Riding)	1	Nil	Nil	15/-	—	—

Manufacturing Companies.

Assoc. Elec. Ord.	1	4	4	20/-	—	4 0 0
Do. Pref.	1	8	8	32/6	—	4 18 6
Babcock & Wilcox	1	14	9	39/6	—	4 11 2
British Aluminium Ord.	1	5	5	30/6	+6d.	3 5 8
British Insulated Ord.	1	15	15	73/9	—	3 19 2
Brush Ord.	Stock	Nil	Nil	40	—	—
Callender's	1	15	15	68/3	—	4 8 0
Do. 6½% Pref.	1	6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord.	5/-	22½	—	18/3	—	6 5 7
Do. 8% Pref.	1	8	8	31/3	—	5 2 5
Edison-Swan 1st Pref.	1	7½	7½	21/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	10/-	—	—
Enfield Cable Ord.	1	25	25	95/-	—	5 5 5
English Electric	1	Nil	Nil	8/9	—9d.	—
Do. do. Pref.	1	Nil	Nil	13/9	—⅛	—
Ever Ready	5/-	35	35	29/9	+6d.	5 16 6
Ferranti Pref.	1	7	7	27/6	+6d.	5 1 10
G.E.C. Pref.	1	6½	6½	32/-	—	4 1 2
Do. Ord.	1	8	8	45/3	—	3 10 8
Henley's	1	30	30	6½	—	4 12 4
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	3/3	—	—
Johnson & Phillips	1	5	5	20/-	—	5 0 0
Siemens Ord.	1	7½	6½	24/6	—	5 6 1
Telegraph Construction	£1	Nil	Nil	27/6	+⅛	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1932

3737. "Automatic control devices for electric arc-welding apparatus." W. R. Hume and Hume Steel, Ltd. February 8th, 1932. (399846.)

3937. "Sparking plugs." T. W. Warren. February 10th, 1932. (399847.)

6106. "Systems for producing light of a periodically varying intensity." British Thomson-Houston Co., Ltd. February 28th, 1931. (399787.)

6957. "Portable electric vacuum cleaners." W. Steudel (trading as Jacob Geb). March 8th, 1932. (399789.)

7333. "Protective systems for sectionalised electric supply networks." T. W. Ross and Associated Electrical Industries, Ltd. March 11th, 1932. (399806.)

9153. "Speed control of dynamo-electric machines." International General Electric Co., Inc. March 30th, 1931. (399830.)

9285. "Multi-outlet electric switches." Siemens Bros. & Co., Ltd., and D. A. Christian. March 31st, 1932. (399791.)

9632. "Systems for controlling electric motors." W. T. Gray and Associated Electrical Industries, Ltd. April 4th, 1932. (399832.)

9661. "Thermionic valves and the like and processes for the manufacture thereof." Marconi's Wireless Telegraph Co., Ltd. April 3rd, 1931. (399797.)

10100. "Art of producing artificially binaural sound effects." W. B. Jones. April 8th, 1932. (399855.)

10367. "Automatic switches for use in telephone or like systems." Automatic Electric Co., Ltd., and R. N. Saxby. April 11th, 1932. (399815.)

10567. "Arrangements for the control of electric motors equipped with series field windings." G. H. Fletcher and Associated Electrical Industries, Ltd. April 13th, 1932. (399837.)

10632. "Wireless aerials for use on short waves." Marconi's Wireless Telegraph Co., Ltd., N. Wells and E. Green. April 13th, 1932. (399843.)

10633. "Frequency indicators." Marconi's Wireless Telegraph Co., Ltd., and T. D. Parkin. April 13th, 1932. (399844.)

10719. "Voltage regulators for dynamo-electric machines." International General Electric Co., Inc. April 14th, 1931. (399864.)

10743. "Telephone systems." Siemens Bros. & Co., Ltd., and R. G. Dixon. April 14th, 1932. (399866.)

10747. "Electrical measuring instruments." Marconi's Wireless Telegraph Co., Ltd., T. D. Parkin and K. S. Webb. April 14th, 1932. (399867.)

10876. "Electrical signalling systems." Automatic Electric Co., Ltd. June 8th, 1931. (399875.)

10890. "Firing switches for submarine mines." Vickers-Armstrong, Ltd., and H. B. Pratt. April 15th, 1932. (399877.)

10952. "Control equipments for electric locomotives." G. R. Higgs, T. A. Prentice and Associated Electrical Industries, Ltd. April 16th, 1932. (399881.)

10977. Electric storage batteries or accumulators." F. Temple. April 16th, 1932. (399882.)

11202. "Direct-current generators." Sir W. G. Armstrong, Whitworth & Co. (Engineers), Ltd., and C. M. Beckett. April 19th, 1932. (Addition to 374565.) (399888.)

11343. "Automatic switchgear employed in connection with electrical installations of railway vehicles or the like. F. Karim. April 20th, 1932. (399890.)

11622. "Magneto-electric machines." British Thomson-Houston Co., Ltd., and L. Griffiths. April 22nd, 1932. (399894.)

11690. "Electric fuses." V. Hope. April 23rd, 1932. (399896.)

12598. "Distributing or separating boxes for electric cables." F. H. Wheeler. May 2nd, 1932. (399902.)

12907. "Terminal connections for electric cables." Callender's Cable & Construction Co., Ltd., and A. E. Wilson. May 4th, 1932. (399904.)

13426. "Electric lampholders." G. E. Chalk. May 10th, 1932. (399909.)

15213. "Electric motor control systems." British Thomson-Houston Co., Ltd. May 28th, 1931. (399924.)

17620. "Magnetic clutches." Chance Bros. & Co., Ltd., and J. H. Abbink-Spaink. June 22nd, 1932. (399939.)

17751. "Electrical contact pieces." E. Kleinmann and A. Mendel. June 23rd, 1932. (399943.)

21466. "Ganged and other condensers and other elements of radio communication apparatus." Lissen, Ltd., and R. P. Richardson. July 29th, 1932. (399955.)

21922. "Apparatus for determining the direction of magnetic or electro-magnetic fields." Soc. Industrielle des Procédés, W. A. Loth. August 6th, 1931. (399957.)

22866. "Cathode-ray tube apparatus." Marconi's Wireless Telegraph Co., Ltd. August 15th, 1931. (399961.)

24558. "Manufacture of high ohmic resistances." Elektrische Gluhlampenfabriken Kremenezky Akt.-Ges. March 26th, 1932. (399967.)

26127. "Anode insulation of mercury-vapour rectifiers." Allmänna Svenska Elektriska Aktiebolaget. September 21st, 1931. (399973.)

26733. "Electric gas-detecting lamp." W. M. Thornton. September 27th, 1932. (399978.)

29128. "Electric soldering irons." General Electric Co., Ltd., and J. R. Hunt. October 18th, 1932. (399987.)

35005. "Electric heating and cooking apparatus." G. Hollasch. December 9th, 1931. (400011.)

35345. "Electric selective receiving apparatus responsive to code signals." A. S. Litström. December 14th, 1931. (400014.)

35991. "Electric furnaces." Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St. Gobain, Chauny & Cirey. December 26th, 1931. (400020.)

36473. "X-ray tubes having a rotatable anode." C. H. F. Müller Akt.-Ges. January 7th, 1932. (400022.)

36780. "Radio and like transmitters and generators." Telefunken Ges. für Drahtlose Telegraphie. December 29th, 1931. (400025.)

1933

189. "Light-transmitting covers for light sources." Holophane, Ltd. October 4th, 1932. (400028.)

190. "Light-mixing apparatus." Holophane, Ltd. July 1st, 1932. (400029.)

1508. "Plug for use with electrical apparatus." J. Feldman. January 17th, 1933. (400032.)

1509. "Switches for electric irons and other electrical appliances." J. Feldman. January 17th, 1933. (400033.)

1808. "X-ray device, particularly for dental purposes." C. H. F. Müller Akt.Ges. February 2nd, 1932. (400036.)

2147. "Light-mixing apparatus." Holophane, Ltd. July 1st, 1932. (400038.)

3013. "Electric headlights for motor vehicles." H. T. Richter. March 8th, 1932. (400046.)

4801. "Indirectly-heated cathodes for electron-discharge devices." International General Electric Co., Inc. February 16th, 1932. (400058.)

5441. "Cathode-ray or Braun tubes suitable for use for television and like purposes." Telefunken Ges. für Drahtlose Telegraphie. February 22nd, 1932. (400062.)

5754. "Electric fluid temperature maintainers for use with dental syringes." W. I. Carpenter. February 24th, 1933. (400064.)

7010. "Switch for electric irons and other electric hand tools." J. Feldman. March 8th, 1933. (400073.)

7174. "Automatic traffic-controlling systems." Aktieselskapet Elektrisk Bureau. March 11th, 1932. (400074.)

8508. "Cooling devices for the anodes of metal-vapour rectifiers." Allmänna Svenska Elektriska Aktiebolaget. March 23rd, 1932. (Addition to 348367.) (400083.)

11676. "Voltage control of parallel alternating current circuits." English Electric Co., Ltd., W. E. M. Ayres and R. P. E. Tabb. April 21st, 1933. (400100.)

12956. "Moving-coil loud speakers." R. A. Rothermel. May 3rd. 1933. (400119.)

15515. "Electrical weft feelers for looms." Soc. Anon. A. Saurer. June 8th, 1932. (Addition to 381887.) (400132.)

20147/8. "Pantograph current collectors for electric railways and the like." English Electric Co., Ltd. August 13th, 1932. (400151/2.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 1st:—

Artisol. No. 543367. Class 8. Electric arc and incandescent lamps for cinematograph projectors, and searchlight apparatus. —Zeiss Ikon Gesellschaft, Dresden. (British representatives: Frank B. Dehn & Co., 103, Kingsway, W.C.2.)

Edistat. No. 543065. Class 13. Electrical immersion heaters. —Edison Swan Electric Co., Ltd., 123-125, Queen Victoria Street, E.C.4.

Meikeith. No. 544907. Class 16. Porcelain and earthenware. —Excel Electrical Equipment Co., Ltd., Adelaide House, King William Street, E.C.4.

The Incidence of Lightning

THE second annual report on summer thunderstorms shows that thunder or lighting occurred somewhere in the British Isles on 115 days out of 183 in the six summer months of 1932. Corresponding figures for 1931 show that the total number of days in England, Wales, and the British Isles are very similar in the two summers, while those for Scotland and Ireland show a marked change, being greater in 1932. The worst months were May and July in England, August in Wales, July in Scotland, and June and July in Ireland. The great similarity between all the monthly totals except June (decrease in 1932) in the two years in England is noteworthy. Two years of winter census 1926-28 indicate that in England there were one-third more days with thunder in summer than in winter, in the four seasons under review, but that in Scotland and Ireland there was a reduction in summer. A general report on winter census 1925-29 is being prepared. An illustrated section is devoted to a report on trees struck by lightning, including two telephone and one wireless poles. The wireless pole was struck from the bottom and the aerial fused; the receiver was properly earthed and undamaged. The only tree fired by lightning of which a full account is available was supporting an aerial. No damage was done to the wireless set, but the electric light fuses in the house were blown. It is reassuring to learn that aerials attached to trees do not seem to be especially susceptible to lightning strokes, or to greater danger if they are struck. The interest shown by electricity distributing authorities in these records suggests that the census aspect and the production of thunderstorm maps should take priority over the analytical aspect. The permanent address of this thunderstorm census organisation is c/o Royal Meteorological Society, 49, Cromwell Road, South Kensington, S.W.7.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Houses (2,000), £700,000 five-year plan, and forty-five houses, Seaton district; Offices, Town House.

Barking.—Houses (114); Thomas Bates & Son, Ltd., builders. Public baths, Becontree; borough engineer.

Barrow-in-Furness.—Hospital extensions (£5,579); Moody & Thompson.

Beddington and Wallington.—Factory, Beddington corner; D. R. Bowman, Hackbridge.

Berkshire.—Block for the mental hospital (£21,700); county architect, Reading.

Birmingham.—Cinema, Hagley Road West, Quinton, with electrical work (£30,000); Satchwell & Roberts, 6, New Street, and H. W. Weedon, 84, Colmore Row, joint architects. Block of shops, Yardley Road, Acock's Green, with electrical work; J. T. Harris, builders, Oakwood Road. Structural alterations to Tindal Street Council schools (£4,000); J. Bowen & Sons, builders, George Street.

Bishop Auckland.—Casual wards (£4,440); G. W. Lazenby & Co., Ltd.

Blackpool.—Cinema and shops, Lytham Road; Mr. and Mrs. Pritchard. Factory, Plymouth Road, Bispham, for Associated Textile Industries (Macclesfield), Ltd., Industrial Buildings, Macclesfield (£100,000); Halstead Best, architect, Leeds Buildings, Clifton Street. Block of shops and offices, Church Street and Cookson Street; F. Wood, borough surveyor, Municipal Buildings, Town Hall Street. Junior school, Hawes Side Lane, for E.C.

Bootle.—Houses (70), Burnie Avenue; J. W. Jones & Sons, Ltd. Houses Pleasant View; borough engineer.

Bridlington.—Public conveniences and shelters, Princess Mary Promenade (£4,363); J. M. Smallwood & Sons, builders.

Burnham.—Casual wards; Berks, Bucks and Oxon Joint Vagrancy Committee.

Cardiff.—Church, Ely, Llandaff, for the Rev. the Lord Bishop of Llandaff; T. Roderick & Sons, architects, 24, Clifton Street, Aberdare.

Carlisle.—Offices, Warwick Road and Crosby Street, for the Provincial Insurance Co., Ltd., 2, Crescent; H. Irving Graham, chartered architect, 15, Bank Street.

Charlton Kings.—Houses (66), Croft Road; E. H. Bradley & Sons.

Cheltenham.—Swimming pool, Sandford Park (£13,000); E. White, President Landscape Architects' Association.

Chester.—Extensions, mental hospital; city engineer.

Chesterfield (DERBYSHIRE).—Extensions, poor law institution, Newbold Road, for C.C.

Chester-le-Street.—Houses (75), Burnmoor; M. Wilson, architect.

Chorley (LANCASHIRE).—Branch stores, Fazackerley Street, for the Co-operative Society, Ltd., 77, Lyon's Lane; C.W.S. architect's department, 1, Balloon Street, Manchester.

Conisborough (YORKS).—Houses (100); U.D.C. surveyor.

Croydon.—Schools, Waddon & Shirley, for Borough E.C.; director of education, Katherine Street.

Dewsbury.—Houses (146); borough surveyor.

Doncaster.—Extensions, Grey Friars Road baths (£6,387); Hemsworth Bros., builders.

Durham.—Vagrancy ward, Barnard Castle Poor Law Institution (£4,440); G. W. Lazenby & Co., Ferry Hill. Vagrancy ward, Easington Institution (£2,800); Randle & Co., builders, Sunderland. Alterations to Esh Winning Council School for County E.C.; H. Eisel, builder, Coundon.

Easington.—Reconstruction of casual wards (£2,258); Randle & Co., Ltd.

Eastbourne.—Additions to Royal Parade East for the Beach Laundry Co. (1929), Ltd., with electrical work; Scales & Baker, architects, Lloyds Bank Chambers.

Edinburgh.—Houses (34), Clermiston Road, Cramond Bridge, for the Edinburgh Housing Association, Ltd.; A. H. Mottram, architect, 59, Frederick Street. Bakery, West Bryson Road, for the Edinburgh and Dumfries-shire Dairy Co., Ltd.; M. Purdon Smith, architect, 95, Irish Street, Dumfries. Church and hall, Stenhouse Drive, for the Church of Scotland (£11,000); J. Inch Morrison, architect.

Essex.—Technical college, Barking, for County E.C.; director of education, Chelmsford.

Eston.—Houses (200), Grangetown Estate; U.D.C. surveyor.

Falkirk.—Church, High Bonnybridge, with electrical work (£7,000); H. Wilson, architect, Station Road, Grangemouth.

Glasgow.—School, Dixon Road; Burnet, Son & Dick, architects, 16, Blythswood Square. Electrical work for Trades School, Shamrock Street (£7,008) foo E.C.; Harland & Wolff, Ltd., Govan.

Gloucester.—Re-erection of factory, Magdala Road, for the Gloucester Shirt Co., Ltd.

Hastings.—Covered parade (£32,000); borough surveyor. Alterations to Royal Albion Hotel, Marine Parade; John S. Quilter & Sons.

Heckmondwike.—Houses (120): U.D.C. surveyor.

Hertfordshire.—School, Goffs Oak, Cheshunt, and extensions, Northgate School, Bishop's Stortford, Boreham Wood, and Girls' Grammar School, Ware (£2,500); county surveyor.

Hetton-le-Hole.—Houses (348): U.D.C. surveyor.

Heywood.—Houses (52), Heap Housing Estate, Heap Bridge; Renouprex & McLeod, builders, Gregge Street Joinery Works.

Huddersfield.—Alterations and additions to Royal Infirmary; Calvert & Jessop and Joseph Berry & Sons, associated architects, 1, Market Walk.

Irish Free State.—(CASTLEBAR, Co. MAYO).—Extensions, District Mental Hospital, for the Committee of Management; P. J. Munden, architect, 28, South Frederick Street, Dublin.

Isle of Man.—School (£8,000), Pulrose, Douglas, for E.C.; director of education, Douglas.

Keighley.—Additions to works, Greengate Road, for George Hattersley & Sons, Ltd.; Thos. Duckett & Son, builders, Belmont Wharf, Skipton.

Kingston-on-Thames.—School (400 places), Latchmere, for Borough E.C.; Dr. J. S. Hawnt, secretary.

Leatherhead.—Public offices, with electrical work; U.D.C. surveyor.

Little Hulton (LANCASHIRE).—Houses (44), Greenheys; J. Howard, surveyor, Town Hall, Walkden.

Llanfyllin (MONT).—Institute; Ridge & Fox, architects, Bank Chambers, Oswestry.

London.—(CHELSEA).—Reconstruction of bridge (£480,000); Sir Frederick Palmer, for L.C.C. (GREENWICH).—Tenements (84), Hughes Fields Estate (£36,984); Henry Boot & Sons, Ltd. (HAMPSTEAD).—Flats (31), Lawn Road; Wells Coates. (KENNINGTON).—Houses, Oval (£500,000); L.C.C. architect. (POPLAR).—Tenements, Bromley Maltings (£17,000); L.C.C. architect. (SOUTHWARK).—Tenements, Doddington Grove (£28,478); R. J. Rowley, Ltd., Tottenham, N. (WEST HAM).—Nurses' home and domestic staff quarters, Whipps Cross Hospital (£55,500); borough engineer.

Longbenton.—Houses (120); W. Bean, U.D.C. surveyor.

Manchester.—Houses (121), Aldwyn Park Estate, Audenshaw; A. J. Franks, builders, Slate Lane, Audenshaw. Flats (72), Pink Bank Lane, Gorton, for Sutton's Dwellings Trust; H. S. Fairhurst & Son, 55, Brown Street.

Middleton (LANCS).—Houses (52); borough surveyor.

Newcastle-on-Tyne.—Houses (164); R. E. Roberts, architect, 13, Cloth Market. Offices and stores, Walker Road, for R. Jacobs & Co.; T. Curry & Son, builders, Meldon Terrace.

New Forest (HANTS).—Houses (40); R.D.C. surveyor.

Northern Ireland.—(Co. ARMAGH).—School, Lurgan, with electrical work, for County E.C.; Isaac Copeland & Son, builders, Lower Windsor Avenue, Belfast.

North Riding.—School, Grangetown Estate, Eston, for County E.C.

Northumberland.—Infants' school, Princess Louise Road, Blyth (£9,000), with electrical work; G. Towers, builders, 77, Union Street, Blyth. School, Choppington Guide Post; J. Goulding & Son, builders, Blyth. School centres, for five schools (£7,000), for County E.C.

Oldham.—Houses, Collier Hill; borough surveyor.

Paisley.—Public library and museum; J. Keppie & Henderson, architects, Glasgow.

Portsmouth.—Church, London Road; Methodist trustees.

Ramsgate.—Houses (91); borough engineer. Premises, Harbour Station site (£15,000), for General Amusements (Ramsgate), Ltd.

Romford.—Victoria Hospital, with nurses' home, administration block and operating theatre; W. Evans, architect.

Rotherham.—Swimming baths and school (400 places), Eastwood; Major V. Turner, borough engineer.

Runcorn.—Houses (57), for J. Dolan & Sons, Napier Street, Warrington.

St. Alban's.—Extensions, Hill End Hospital (£114,968); H. M. Nowell, Ltd.

St. Helens (LANCS).—Houses (195); A. P. Statham, borough engineer.

Scarborough.—Factory, Seamer Street, for the Gryphon Leather Co.; Wilkinson & Smith, architects, 6, Queen Square.

Sheffield.—Houses (1,500), Birley Moor; Hy. Boot & Sons, Ltd., builders, 152, Moore Street. Houses (33), Rydalhurst Avenue; F. Lamb. Houses (25), Springfield Road; W. Newsome. Flats (60), Tree Root Walk; J. H. S. Randall, Ltd. Houses (272), Woodlands Estate; Reeves Charlesworth, Ltd. Houses (316), Wybourn Estate (£96,064); Melling Bros., Ltd. School and bath, Woodthorpe Estate (£71,000), and reconstruction of City Museum (£16,000); city architect.

Shipley.—Houses (40), Wrose Road; Wrose Hill Estate Co., Ltd. Offices, workshop, &c., Manor Lane; J. E. Wilkinson and Sons.

Sittingbourne.—Extensions, paper mills, with power plant, for Edward Lloyd, Ltd., Kemsley.

Southend-on-Sea.—St. Andrew's Church, Westcliff (£10,000); Newberry & Fowler, architects, Parliament Mansions, Westminster, S.W.

South Shields.—Houses (25), Morpeth Avenue, and central school; F. W. Newby, architect. Bank, shop and flats, Sunderland Road; Martin's Bank, Ltd. Market (£11,500); borough engineer. High School for Boys; G. R. Smith, architect. School centre and gymnasium, Westoe Secondary School; H. Hill, architect.

Stirlingshire.—School for defective children, Stirling (£25,000); county architect, Stirling.

Stone (STAFFS).—Houses (60); U.D.C. surveyor.

Surbiton.—Church, Tolworth (£3,825); A. & B. Hanson, Ltd., builders, Southall.

Torquay.—Library, rear of Town Hall; borough engineer. Senior school, Barton Road, for E.C.

Twickenham.—Block of flats, with ballroom, restaurant, &c., for Farebrother, Ellis & Co., Fleet Street, E.C.; Sir Aston Webb and Son.

Tynemouth.—Houses (48), Ridges Estate; R. Barron & Co., builders, Lemington.

Wallasey.—Houses (42), Breck Road; G. A. Lindley.

Walsall.—Hotel and shops, Digbeth, with electrical work (£47,652); C. Bryant & Sons, builders, Whitmore Road, Birmingham.

Wantage.—Houses (300), Harwell, for Structural Contractors, Ltd.

Warley.—R.C. church; W. J. Whittall & Son, builders, Birmingham.

Warwickshire.—School (400 places), Exhall, for County E.C.; county architect, Leamington Spa.